











*Catalog of Hymenoptera in America North of Mexico*



*Carl F. W. Muesebeck*

This catalog is dedicated to our cherished colleague with affectionate regard for his kindness and with admiration for his distinguished scholarly contributions to our knowledge of North American Hymenoptera for more than half a century.

# Catalog of Hymenoptera in America North of Mexico

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Prepared cooperatively by  
specialists on the various groups of Hymenoptera  
under the direction of

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United States Department of Agriculture

## VOLUME 2

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Apocrita (Aculeata)

SMITHSONIAN INSTITUTION PRESS

Washington, D.C.

1979

*Library of Congress Cataloging in Publication Data*

Main entry under title:

Catalog of Hymenoptera in American north of  
Mexico.

"An outgrowth of . . . Hymenoptera of America  
north of Mexico, synoptic catalog (1951) in-  
cluding the first and second supplements (1958,  
1967)"

Includes index.

CONTENTS: v.1. Symphyta and Apocrita  
(Parasitica). — v. 2. Apocrita (Aculeata)

1. Hymenoptera — North America. 2. Insects —  
North America. I. Krombein, Karl V.

QL567.1.A1C37 595.7'9097 78-606008

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# Introduction

By

Karl V. Krombein,

Paul D. Hurd, Jr.,

and

David R. Smith

This catalog, which is an outgrowth of the highly successful Hymenoptera of America North of Mexico Synoptic Catalog (1951), including the first and second supplements (1958, 1967), provides simultaneously, by use of computer technology (Krombein, Mello and Crockett, 1974. Ent. Soc. Amer., Ann. 20 :24-29), a printed version as well as a computer-queriable data base of the basic systematic, biological, and morphological information on the order Hymenoptera as it occurs in America north of Mexico. While the format of the present catalog closely parallels that of the original catalog, every effort has been made to increase the information content to fulfill better the needs of the biological community. This has been accomplished chiefly by the introduction of textbook prose at most higher category levels, by the presentation of explanatory or descriptive comments as appropriate, and by the inclusion of more complete listings of citations to taxonomic, biological, and morphological literature at all hierarchical levels together with parenthetical annotations concerning the content for many of these citations. Similarly, the data about hosts, parasites, prey, predators, and pollen sources are covered more fully than in the original catalog. Since these data have been reported in various ways and under differing names in the primary literature, an

attempt has been made to organize this information and present it, usually, alphabetically even though sometimes such data have been recorded in the literature with scientific or vernacular names or both. Although many of these names have been checked for accuracy, no consistent attempt has been made to verify that the names agree with current usage or status. While those authors of zoological names are usually abbreviated in the citation of hosts, parasites, and the like, the authors of the scientific botanical names are not included. Elsewhere in the catalog, the last name of an author is cited in full, but without initials. Since the technology employed in the preparation of this catalog precluded the use of diacritical marks, these have been omitted and consequently, as in the case of the umlaut, a variant spelling has been substituted as appropriate.

The International Code of Zoological Nomenclature (1961) including the intent and preamble of the Code and of any pertinent opinions usually has been followed. Thus a name in current usage as determined by the code is employed, but mention is made, as appropriate, that an application is pending before the International Commission of Zoological Nomenclature.

An attempt has been made to record all the recent taxa, with their synonyms, described

from, or known to occur in, the political divisions of the conterminous United States, Canada, Alaska, and Greenland. Insofar as known, all species introduced from other countries and liberated in America north of Mexico for biological control purposes have been listed. Some of these have never been recovered and, apparently, were unsuccessful in establishing themselves. For each such species a statement has been included, following the distribution, that the species was liberated but did not become established.

As in the original catalog, the arrangement is systematic for species-groups and higher categories insofar as our present knowledge and the limitations of a linear arrangement permit. The generic and subgeneric concepts represented in this arrangement are based upon what are believed to be the correct type-species. In each instance the type-species is cited together with the authority for the selection. Where designations of type-species have been found to be invalid under the International Code of Zoological Nomenclature, new type-species designations, believed to be valid, are given in the catalog. Generic synonymy is included under the generic headings except where subgenera are recognized, in which cases such synonymy is given under the subgeneric names, and references to revisional or other papers are listed under the appropriate higher category.

The arrangement of species within genera, subgenera, and species groups is alphabetical. Where subspecies are recognized, the subspecific names are placed in alphabetical order under the species to which they belong; and varieties are listed under the particular species or subspecies in which they were described. In each case the specific, subspecific, or infrasubspecific, name is followed by an indication of the known distribution, and by brief statements, as appropriate, of preferred habitats or the like, hosts, parasites, prey, predators, or pollen sources. Much of

this information on synonymy, distribution, ecology, hosts, parasites, prey, and so forth has not been published previously. The type localities are usually recorded for those forms that are known only from the localities where the type specimens were obtained. Otherwise the distribution is usually shown by states and provinces, or by other means such as life zones.

Since unquestionably a catalog is indispensable in the support of systematic and other biological research, no effort has been spared toward making this catalog as useful as possible to all of the scientific community interested in these fascinating insects.

## LITERATURE COVERAGE

All authors have attempted to include all pertinent references to synonyms, revisions, taxonomy, biology, and morphology beginning with 1758, the publication date of the 10th edition of "Systema Naturae" by Linnaeus. The cut-off dates vary for the several sections of the catalog and are as follows: Symphyta through 1974;

Ichneumonidea through 1976;

Chalcidoidea—Torymidae (except Agaoninae) and Encyrtidae through 1976; other families and Agaoninae through 1972;

Cynipoidea through 1972;

Evanoidea through 1976;

Pelecinoidea, Proctotrupeoidea, and Ceraphronoidea through 1972;

Trigonaloidea through 1976;

Bethyloidea and Scolioidea through 1975;

Formicoidea through mid-1975;

Vespoidea, Pompiloidea, and Sphecoidea through 1975; and

Apoidea through 1976.

All authors have included some references subsequent to the dates listed above.

# Abbreviations and Symbols

## LITERATURE CITATIONS

The source for journal abbreviations is Whitlock, C., 1939, *Abbreviations used in the Department of Agriculture for titles of publications*, United States Department of Agriculture Miscellaneous Publication No. 337, 278 pages. Abbreviations for other titles and journals not found in Whitlock essentially follow the same format and abbreviations that she recommends. Book titles are usually shortened to omit irrelevant adjectives and include abbreviations, e.g.: Wheeler and Wheeler, 1963. The Ants of North Dakota, p. —, is cited as Wheeler and Wheeler, 1963. Ants of N. Dak., p. —. Certain lengthy non-serial titles are also abbreviated, e.g.: Say, 1824. In Keating, Narr. Long's 2nd Exped., v. 2 (App.), p. —, rather than Say, 1824. In Keating, Narrative of an Expedition to the Source of St. Peter's River, Lake Winnepeck . . . , etc. The titles are intended to be uniform throughout the catalog, but, in a work of this magnitude, there will naturally be some deviations. The abbreviations should be adequate to find the cited publication.

## SYMBOLS AND ABBREVIATIONS

Certain symbols and abbreviations are frequently used in this catalog. Though there may be slight variations in some, they are generally as follows:

(!)—lapse or misspelling of a scientific name.

"♀" = ♀ or "♂" = ♂—incorrect sex determination.

♀ (♂ misdet.) or ♂ (♀ misdet.)—only one of the sexes described belongs to the species cataloged.

♀—female.

♂—male.

W—worker.

S—soldier.

ab.—aberration.

app.—appendix.

cent.—central.

changed status—used after a species-group name to indicate a rank different from that previously accorded to it; not necessarily the same as new status.

desig.—designated; e.g., in type-species designation, "Desig. by Rohwer, 1911."

e., east.—east, eastern.

emend.—emendation.

fasc.—fascicle.

fig., figs.—figure, figures.

h.—heft.

n. comb.—new combination; used after a species-group name to indicate a new generic assignment.

n. name—new name; used after a genus-group or species-group name to indicate a substitute name for a homonym.

N. name—New name; used after a bibliographic citation to indicate a previously proposed name.

Nom. nud.—Nomen nudum.

n. s.—new series.

n. status—new status; used where a taxon is here accorded a rank different from that which it had previously.

N. syn.—New synonymy; used to indicate a synonym newly proposed in this catalog.

n., no., north.—north, northern.

n.e., northeast.—northeast, northeastern.

n.w., northwest.—northwest, northwestern.

orig. desig.—original designation; used to indicate type-species designation.

p., pp.—page, pages.

pl., pls.—plate, plates.

preocc.—preoccupied; used after a genus-group or species-group name to indicate a homonym.

pt.—part.

revised status—revised status; used to denote a taxon that has been removed from synonymy.

ser.—series.

s., so., south.—south, southern.

s.e., southeast.—southeast, southeastern.

s.w., southwest.—southwest, southwestern.

sp., spp.—species.

ssp., sspp.—subspecies.

subg.—subgenus.  
transcont.—transcontinental.  
v., vol.—volume.  
var.—variety.  
w., west.—west, western.

## FAUNAL ZONES

Bor.	Boreal
Canad.	Canadian
Huds.	Hudsonian
Transit.	Transition
Austr.	Austral
U. Austr.	Upper Austral
L. Austr.	Lower Austral
Alleghan.	Alleghanian
Austrorip.	Austroriparian
Carol.	Carolinian
Sonor.	Sonoran
U. Sonor.	Upper Sonoran
L. Sonor.	Lower Sonoran

## GEOGRAPHICAL NAMES

<i>Abbreviation</i>	<i>Political Unit</i>
Ala.	Alabama
Alaska	Alaska
Alta.	Alberta
Ariz.	Arizona
Ark.	Arkansas
B.C.	British Columbia
Calif.	California
Canada	Canada
Colo.	Colorado
Conn.	Connecticut
Del.	Delaware
D.C.	District of Columbia
Fla.	Florida
Ga.	Georgia
Greenland	Greenland
Idaho	Idaho
Ill.	Illinois
Ind.	Indiana
Iowa	Iowa
Kans.	Kansas

Ky.	Kentucky
La.	Louisiana
Labrador	Labrador, Newfoundland (Labrador)
Maine	Maine
Man.	Manitoba
Mass.	Massachusetts
Md.	Maryland
Mexico	Mexico
Mich.	Michigan
Minn.	Minnesota
Miss.	Mississippi
Mo.	Missouri
Mont.	Montana
N. B.	New Brunswick
N. C.	North Carolina
N. Dak.	North Dakota
Nebr.	Nebraska
Nev.	Nevada
Newfoundland	Newfoundland, Newfoundland (insular)
N. H.	New Hampshire
N. J.	New Jersey
N. Mex.	New Mexico
N. S.	Nova Scotia
N. W. T.	Northwest Territories
N. Y.	New York
Ohio	Ohio
Okla.	Oklahoma
Ont.	Ontario
Oreg.	Oregon
Pa.	Pennsylvania
P. E. I.	Prince Edward Island
Que.	Quebec
R. I.	Rhode Island
Sask.	Saskatchewan
S. C.	South Carolina
S. Dak.	South Dakota
Tenn.	Tennessee
Tex.	Texas
U. S.	United States
Utah	Utah
Vt.	Vermont
Va.	Virginia
Wash.	Washington (state)
W. Va.	West Virginia
Wis.	Wisconsin
Wyo.	Wyoming
Yukon	Yukon Territory

# TAXONOMIC AND NOMENCLATURAL CHANGES

The catalog contains one undiagnosed new species in the Ichneumonidae, *Pterocormus clasma* Carlson, p. 521, proposed for the taxon misidentified as *Ichneumon canadensis* Cresson by Heinrich (1961).

The catalog contains one undiagnosed new

genus also in the Ichneumonidae, *Woldstedtius* Carlson, type-species *Bassus biguttatus* Gravenhorst, p. 719, proposed for *Syrphoctonus* Foerster *sensu* Dasch (1964).

The following new names are proposed to replace preoccupied names:

## Tenthredinidae

<i>Pachynematus gamus</i> Smith for <i>Pachynematus graminis</i> Marlatt (1896) .....	p. 58
<i>Nematus attus</i> Smith for <i>Amauronematus dyari</i> Marlatt (1896) .....	p. 68
<i>Amauronematus peralus</i> Smith for <i>Nematus pectoralis</i> Cresson (1880) .....	p. 80

## Ichneumonidae

<i>Oedomopsis davisi</i> Carlson for <i>Trophon ? nasutus</i> Cresson (1868) .....	p. 366
<i>Gelis cushmani</i> Carlson for <i>Hemiteles apantelis</i> Cushman (1927) .....	p. 405
<i>Oresbius shumaginensis</i> Carlson for <i>Stiboscopus ferrugineus</i> Ashmead (1902) ...	p. 438
<i>Pterocormus dionymus</i> Carlson for <i>Ichneumon anonymus</i> Heinrich (1961) .....	p. 522
<i>Casinaria affinisima</i> Carlson for <i>Casinaria affinis</i> Walley (1947) .....	p. 635

## Pteromalidae

<i>Mesopolobus fuscipedes</i> Burks for <i>Platyterma fuscipes</i> Ashmead (1896) .....	p. 816
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## Eurytomidae

<i>Harmolita ovatella</i> Burks for <i>Harmolita ovata</i> Phillips and Emery (1919) .....	p. 840
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## Eulophidae

<i>Syntomosphyrum orgyiazele</i> Burks for <i>Tetrastichomyia orgyiae</i> Girault (1916) ..	p.1005
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## Diapriidae

<i>Trichopria kiefferi</i> Muesebeck for <i>Diapria montana</i> Kieffer (1906) .....	p.1147
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## Scelionidae

<i>Trimorus contractus</i> Muesebeck for <i>Gryon flavipes</i> Ashmead (1893) .....	p.1162
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## Ceraphronidae

<i>Aphanognmus harringtoni</i> Muesebeck for <i>Aphanognmus salicicola</i> Harrington (1899)	p.1190
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## Megaspilidae

<i>Dendrocercus obscurellus</i> Muesebeck for <i>Atritornus californicus</i> Kieffer (1906) ..	p.1194
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## Masariidae

<i>Euparagia richardsi</i> Bohart for <i>Psiloglossa simplicipes</i> Rohwer (1909) .....	p.1470
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## Philanthidae

<i>Cerceris bolingeriana</i> Krombein for <i>Cerceris bolingeri</i> Scullen (1972) .....	p.1730
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## Anthophoridae

<i>Triepcolus mitchelli</i> Hurd for <i>Triepcolus subhumatus</i> Mitchell (1962) .....	p.2094
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There are a number of other nomenclatural and taxonomic changes. These are considered of lesser bibliographic importance than the new names, so tabulations of them are deferred to Volume 3 which will also contain the indexes and a table of the number of

valid genera and species for each family and higher category. These nomenclatural and taxonomic changes are as follows:

A number of generic transfers are made. They are usually cited in the text as *xanti-anum* (Saussure), n. comb. The authority

responsible for the transfer is the author of that section unless the name of another specialist is included.

There are also a number of instances where a taxon formerly considered to be a species is treated here as a subspecies of another taxon, or where a taxon formerly considered to be a subspecies is now raised to specific rank. The authority responsible for the change is the author of that section unless the name of another specialist is included. These are usually cited in the text as *clavatum johannis* (Richards), *n. status* or *alba* Rohwer, *n. status*.

The words—changed status—occasionally follow the author of a species-group name. This indicates that the taxon has a rank

different from that accorded it elsewhere. It is not the same as new status for it reflects a change which has already been published.

In a few taxa, the words—revised status—follow the author of a species-group name. This denotes a taxon which has been removed from synonymy.

There are a few new synonyms at the genus-group level and numerous new synonyms at the species-group level. These are indicated by the abbreviation *N. syn.* following the bibliographic citation of the new synonym. As noted above, the synonymy is to be attributed to the author of the section unless the name of another specialist appears in parentheses following the abbreviation *N. syn.*

## *Volume 3*

It is intended that Volume 3 will contain separate indexes to the taxa of Hymenoptera, and to their hosts, parasites, prey, predators, and pollen and nectar sources. Preparation of the indexes has already begun, and we anticipate that the tapes for Linotron production will be sent to the Government Printing Office

during 1978. We will also include in Volume 3 a tabulation of the number of valid genera and species for each family and higher category, and lists of the nomenclatural and taxonomic changes other than the new names which are listed above.

## *Acknowledgments*

Preparation of the catalog and funding for its publication have had the enthusiastic support of Porter M. Kier, Director, National Museum of Natural History (NMNH), Smithsonian Institution (SI) and of Lloyd V. Knutson, Chairman, Insect Identification and Beneficial Insect Introduction Institute, U.S. Depart-

ment of Agriculture. The catalog in its printed form could not have been achieved without their help, and we are most grateful that their assistance was available whenever we required it.

We are indebted to a host of cooperating hymenopterists for generous assistance which

has greatly enhanced the content and quality of the catalog. The aid furnished has involved such diverse activities as reviewing preliminary drafts of various sections, and providing new information on taxonomy, synonymy, distribution, and biology.

In the Symphyta, H. E. Milliron, formerly of the Biosystematics Research Institute (BRI), Agriculture Canada, Ottawa, reviewed parts of the manuscript and provided information, as did H. R. Wong, Northern Forest Research Centre, Edmonton, Alberta, for *Pristiphora* Latr. H. Greenbaum, University of Florida, Gainesville, furnished data on Florida sawflies.

The accuracy of host names in the Parasitica was checked by the following specialists: Smithsonian Institution—J. F. G. Clarke, D. R. Davis, W. D. Duckworth, T. L. Erwin, W. D. Field, and R. C. Froeschner; Systematic Entomology Laboratory (SEL), U. S. Department of Agriculture—D. C. Ferguson, R. J. Gagné, R. D. Gordon, A. B. Gurney, J. L. Herring, R. W. Hodges, J. M. Kingsolver, J. P. Kramer, A. S. Menke, D. M. Miller, L. M. Russell, C. W. Sabrosky, D. R. Smith, T. J. Spilman, M. B. Stoetzel, E. L. Todd, R. E. Warner, and R. E. White. D. M. Weisman (SEL) identified the remains of some lepidopterous larvae which served as hosts.

Specialists who were helpful in the Ichneumonidea were: L. E. Caltagirone, University of California, Albany, and C. C. Loan (BRI), who reviewed parts of the manuscript on Braconidae; C. van Achterberg, Waarder, The Netherlands, W. R. M. Mason (BRI), R. D. Shenefelt, University of Wisconsin, Madison, and R. Wharton, University of California, Berkeley, who provided advice and information on Braconidae; H. K. and M. C. Townes, American Entomological Institute, Ann Arbor, Michigan, who provided information and advice on Ichneumonidae; and P. M. Marsh (SEL), who proofed the first-phase computer printouts for Mesochorinae, Diplazontinae, Oxytorinae and Orthocentrinae, and the third-phase edit for Ichneumoninae.

Z. Boucek, Commonwealth Institute of Entomology, London, and M. Graham, Oxford University, provided much information on Chalcidoidea, and D. P. Annecke, Plant Pro-

tection Research Institute, Pretoria, South Africa, advised on the placement of some species assigned erroneously to *Aphyens* Mayr. A special debt of gratitude is due C. F. W. Muesebeck who painstakingly proofed all edit phases of the computer printouts for Encyrtidae and Torymidae and all but the first-phase edits of all other families of Chalcidoidea.

D. B. Krombein provided welcome assistance by helping to proof the manuscripts and printouts for all superfamilies of aculeate wasps. F. D. Parker, Bee Biology and Systematics Laboratory, Utah State University, Logan, furnished biological data for a number of Utah wasps.

We are grateful to R. M. Bohart, University of California, Davis, for reviewing the manuscript on Chrysididae and for considerable other assistance which included information on new synonyms and distribution in the Elampinae and Chrysidinae, and the assignment of taxa to species groups in *Chrysis* L. H. E. Evans, Colorado State University, Fort Collins, reviewed the section on Bethyliidae.

In the Scolioidea, the late J. C. Bradley, Cornell University, Ithaca, New York, and J. G. Betrem, Deventer, The Netherlands, reviewed the manuscript on Scolidae, and H. W. Allen, Moorestown, New Jersey, that on Tiphinae. W. E. Ferguson, San Jose State University, California, and C. E. Mickel, University of Arizona, Tucson, furnished information on synonymy and taxonomy of some Mutillidae.

R. R. Snelling, Los Angeles County Museum, California, and M. R. Smith, Arlington, Virginia, reviewed the section on Formicoidea. J. F. Watkins II, Baylor University, Waco, Texas, reviewed the section on Dorylinae, and A. C. Cole, University of Tennessee, Knoxville, that on *Pogonomyrmex* Mayr. A. Francoeur, University of Québec, Chicoutimi, provided information on the *fusca* group of *Formica* L.

O. W. Richards, British Museum (Natural History), London, and R. M. Bohart reviewed the entire manuscript for Vespoidea. J. van der Vecht, Putten, The Netherlands, recommended the systematic sequence adopted in the Eumenidae and reviewed the manuscript.



M. J. West-Eberhard, Universidad del Valle, Cali, Colombia, and R. R. Snelling reviewed the manuscript on Vespidae and supplied data on taxonomy and biology. J. E. Gillaspay, Texas A & I University, Kingsville, provided information on *Polistes* Latr.

H. E. Evans reviewed the manuscript on Pompilidae, and F. E. Kurczewski, University of Syracuse, N. Y., contributed some prey records.

R. M. Bohart and A. S. Menke generously made available a copy of their manuscript, "Sphecids Wasps of the World," which was most helpful in assembling the section on Sphecoidea; Menke, in addition, reviewed the catalog manuscript for this superfamily. Other specialists contributed data on the groups mentioned after their names: R. E. Coville, University of California, Berkeley (taxonomy and distribution of Trypoxyloniinae); J. E. Gillaspay (Bembicinae); F. E. Kurczewski (biology of Larridae and Crabronidae); R. C. Miller, Cornell University (taxonomy, distribution, and biology of Crabronidae); W. J. Pulawski, Wrocław, Poland (taxonomy and distribution of *Tachysphex* Kohl); and D. Vincent, University of Maryland, College Park (taxonomy and distribution of *Passaloecus* Shuck.).

E. G. Linsley, University of California, Berkeley, reviewed the entire manuscript on Apoidea and offered valuable suggestions. C. D. Michener, University of Kansas, Lawrence, discussed with the author of that section the biology and systematics of bees; many of his suggestions have been incorporated in the classification adopted. The following specialists have cooperated by contributing data on the groups specified after their names: G. E. Bohart, Bee Biology and Systematics Laboratory, Utah State University, Logan (taxonomy and biology of Apoidea); W. E. LaBerge, Illinois Natural History Survey, Urbana (taxonomy of Andrenidae and Anthophoridae); U. N. Lanham, University of Colorado, Boulder (taxonomy of Apoidea); M. A. Lieftinck, Rheden, The Netherlands (taxonomy of Anthophoridae); A. Löken, University of Bergen, Norway (taxonomy of Apoidea); T. B. Mitchell, North Carolina State University, Raleigh (taxonomy of Apoidea); J. S. Moure, Universidade

Federal do Paraná, Curitiba, Brazil (taxonomy of Apoidea); F. D. Parker (taxonomy and biology of Apoidea); J. G. Rozen, Jr., American Museum of Natural History, New York, New York (taxonomy and biology of Apoidea); R. R. Snelling (taxonomy of *Hylaeus* F.); R. W. Thorp, University of California, Davis (taxonomy and biology of Apidae); P. H. Timberlake, University of California, Riverside (taxonomy of Apoidea); and T. J. Zavortink, University of San Francisco, California (taxonomy of Anthophoridae).

C. W. Sabrosky (SEL) has been helpful to all of us in the discussion of abstruse nomenclatural problems. J. F. Gates Clarke (SI) participated patiently in philosophical discussions of a wide variety of subjects pertaining to the catalog. G. C. Steyskal (SEL) was the resource person for the grammar of scientific names and other linguistic matters.

Computerization of the catalog and its production by the computer-driven Linotron required the highly skilled technical expertise of specialists in computer storage and applications. James F. Mello, formerly Chief of the Data Processing (ADP) Program at NMNH, carefully analyzed the 1951 Hymenoptera Catalog and developed the data analysis matrix which governed entry of information into the computer. R. Creighton, Manager, Information Retrieval and Indexing Division, Office of Computer Services (OCS), SI, devised the programs for editing, arranging, querying, and displaying data from the manuscripts. J. J. Crockett, Manager, Software Systems and Program Maintenance (OCS), developed the program for conversion of the computerized data to special magnetic tapes capable of driving the Photo Typesetting Unit, the Mergenthaler Linotron 1010, in the Government Printing Office. T. G. Gautier, Chief (ADP), and D. Bridge, Operations Manager (ADP), maintained daily collaboration with the Editorial Board in assignment of clerical assistance, and production of the edit phases, merge files, and SELGPO printouts.

Finally, we are most grateful for the careful, accurate typing of the manuscripts for computer entry by the corps of dedicated clerk typists. R. M. Garlick served with the

program as principal typist from its inception until his reassignment in mid-1976 as a computer technician; he also trained the other assigned typists. P. R. Brown is currently the only typist assigned full time. Other typists who worked for varying lengths of time

during the six years of manuscript production and computer entry were: L. E. Back, L. M. Bybell, R. Cloyed, L. E. Hatton, M. Monahan, L. G. Oliver, J. Peabody, P. A. Sunkel, and M. F. Ward.

## Division ACULEATA

By KARL V. KROMBEIN

This divisional name is retained because of the substantial biological literature published on the groups of Hymenoptera popularly called ants, wasps and bees. No clear-cut unambiguous criteria exist by which one can separate Aculeata from Parasitica for there are annectent forms in both divisions.

In North America we recognize about equal numbers of valid species-level taxa in the Aculeata and Parasitica (or Terebrantia). However, there are comparatively few undescribed Aculeata, and subsequent revisionary studies probably will synonymize nearly as many taxa now considered to be valid as there will be new taxa described. Undoubtedly there are numerous undescribed small Parasitica.

Aculeata occur in all major zoogeographic regions and on many of the oceanic islands; they are absent from Antarctica. Brothers (1975) recognizes 38 families of Aculeata. The majority occur in America north of Mexico except the Plumatidae, Scolytidae, Loboscelidiidae and Fideiidae (sometimes placed in Megachilidae), all small families with very few species. The Cleptidae are here considered to be a subfamily of Chrysididae. The exotic Loboscelidiidae are best considered as an extremely aberrant subfamily of Chrysididae allied to the Amiseginae. Brothers considered the Crabronidae, here treated as a family, to be a subfamily of Larridae.

Brothers recognized only three superfamilies of Aculeata, placing the scolioid, pompiloid and vespid families in the Vespoidea, and consolidating the Sphecoidea and Apoidea under the former name. Further discussion of Brothers' arrangement will be found under appropriate superfamily headings.

In general the Hymenoptera included in the Aculeata are characterized by conversion of the ovipositor to a stinging function only. The eggs are no longer exerted through the ovipositor as in most Parasitica but through an orifice anterior to it. The ovipositor with associated poison glands now serves several purposes, the temporary or permanent paralysis of the prey of wasps, as a defensive mechanism in bees and some ants, and as an offensive mechanism in some ants. However, annectent forms occur in some Proctotrupoidea of the Parasitica, and Bethyloidea and Scolioidea of the Aculeata. In many higher Parasitica the wing venation and thorax are much more reduced than in the Aculeata.

Biologically the majority of Aculeata may be distinguished by their non-parasitic habits and the construction of nests for their young. Most higher wasps belonging to the Vespoidea, Pompiloidea and Sphecoidea are predaceous upon other arthropods and build nests which vary from simple to quite elaborate. A few species of Pompiloidea and Sphecoidea behave as parasitoids, paralyzing the prey, laying an egg upon it, and making no nest; the prey later recovers and leads a normal life until killed by the growing larva. Most of the vespoid Masaridae and all of the free-living bees have converted to a larval diet of pollen and nectar. Cleptoparasites or brood-parasites, whose larvae develop in the nests of other wasps or bees, have evolved inde-

pendently a number of times in all aculeate superfamilies. However, these biological distinctions break down in most of the more primitive wasps belonging to the Bethyloidea and Scoliidea. Many of these behave as true parasitoids in that the larval prey may be only temporarily paralyzed, occasionally several eggs may be laid on a single prey larva, and frequently no nest whatever is made, the prey being left in situ, or at most a crude cell may be constructed around the subterranean prey as in most Tiphidae and Scoliidae. Parasitism of the egg stage of the host is known only among the Amiseginae (Chrysididae). Polyembryony is unknown, but parthenogenesis occurs in some Aculeata. Usually this is of the facultative kind as is found in social insects such as some ants, vespid wasps and honeybees. It may be obligate in some aculeates, such as the tiphid wasp *Methocha* and some species of the bee genus *Ceratina*, where males are rare or unknown.

The simplest kind of nest among the aculeates is made by the wasp dragging the paralyzed prey into a crevice in or above ground or back into the prey's burrow; the opening is usually sealed off by particles of the substrate to make a crude cell. A second type of nest is also made in a pre-existing cavity, such as borings of beetle larvae in wood or twigs, or in old insect galls or abandoned mud cells. The nest in this second type may be unicellular as in the first kind of nest, or it may consist of a linear series of cells, each cell separated from its neighbor by a partition of mud, wood chips, resin, masticated plant leaves, or other substances. A third kind of nest is excavated by the wasp or bee in the ground, in rotten wood, or in the soft pith of such shrubs as sumac and elderberry. The subterranean nests are frequently unicellular but multicellular nests in the ground, rotten wood or pith may have the individual cells arranged in a linear series or in clusters with the individual cells sealed by a partition or closing plug of the substrate. Occasionally a mud turret may be constructed over the entrance of subterranean nests. Next, there are the nests constructed entirely from foreign materials. Usually these are above ground although some Vespidae and Bombinae have subterranean nests. The nests of solitary species may be made of mud, or a mixture of resin and pebbles, with the cells arranged in parallel tubes, or in clusters or with separate but adjacent cells; some exotic social Vespidae make a mud envelope around combs of hexagonal cells. A number of social species make paper or carton nests in which the nesting material consists of masticated wood fibers, bark or rotten wood. Finally, there is the complex nest of the honeybees constructed from wax secreted from glands in the abdomen of workers.

Aculeate larvae are normally cannibalistic if they come in contact accidentally. This tendency is prevented in multicellular nests by the existence of partitions separating adjacent larvae. However, some species make brood cells in which several larvae develop amicably without the occurrence of cannibalism. Such nests have been reported for a few North American *Isodontia* (Sphecidae) and *Megachile* (Megachilidae), and for many exotic Allodapini (Anthophoridae).

True sociality (eusociality) has arisen independently several times in the higher aculeates, the Formicoidea, Vespoidea, Sphecoidea and Apoidea. All of the ants are eusocial or are social parasites of other ants, but the majority of wasps and bees are solitary species. Wilson (1971) considers that eusocial insects must possess three traits: "individuals of the same species cooperate in caring for the young; there is a reproductive division of labor, with more or less sterile individuals working on behalf of fecund individuals; and there is an overlap of at least two generations in life stages capable of contributing to colony labor, so that offspring assist parents during some period of their life." Presocial insects exhibit one or two of the above traits. Solitary species have none of these traits.

Most solitary aculeates practice mass provisioning, that is, the egg is laid and a store of food is placed in the cell with it, then the cell is closed; in many species the store of food is provided before oviposition. Some sphecoid wasps, such as many Bembicinae (Nyssonidae), have taken the first step toward subsocial status by adopting progressive provisioning. This behavior is characterized by placing the egg on a single prey specimen and not furnishing additional prey until the egg has hatched or by the hatching of the egg before any food is provided; after hatching the larva is fed daily or at intervals as required. Other aculeates, e.g., *Moniaecera* (Crabronidae), some *Andrena* (Andrenidae) and *Exomalopsis* (Anthophoridae), have achieved the higher level of communal status, in which several females use a common burrow entrance but presumably maintain separate cells. A higher level of presocial behavior (quasisocial) is found rarely in some exotic bees where two or more gravid females of the same generation cooperatively construct and provision the cells. Some of our Halictidae have attained the semisocial stage which is similar to the quasisocial except that unmated females of the same generation associate with a

gravid female or females and care for the larvae of the latter. A semisocial colony may evolve into a primitive eusocial colony as happens later in the season in some *Angochlorella* nests when the colony becomes monogynous and only the workers forage for pollen. Another stage toward the eusocial is the subsocial in which one female cares for her own larvae as in many Allodapini (Anthophoridae) and young nests of *Bombus* (Apidae); such a colony may later become truly eusocial as happens when the first brood of *Bombus* workers ecloses and takes over the foraging activities previously performed by the queen.

Taxonomy: Lanham, 1960. Ent. News 71: 85-86 (significance of hind tibial strigil in classification). — Richards, 1972 (1971). Ent. Essays to Commemorate Retirement of Prof. K. Yasumatsu, pp. 1-13, 10 figs. (thoracic spiracles in classification). — Brothers, 1975. Kans. Univ. Sci. Bul. 50: 483-648, 101 figs., 7 tabs. (phylogeny, especially Mutillidae).

Biology: Walsh and Riley, 1869. Amer. Ent. 1: 122-143, figs. 96-112 (habits of wasps). — Ashmead, 1894. Psyche 7: 19-26, 39-46, 59-66, 75-79 (habits of wasps). — Peckham and Peckham, 1898. Wis. Geol. Nat. Hist. Survey, Bul. 2: 1-245, 14 pls. (instincts and habits of solitary wasps in Wis.). — Hartman, 1905. Tex. Acad. Sci., Trans. 7: 15-85, 24 figs., also published as Univ. Tex., Bul. 65, Sci. Series 6: 3-73, 24 figs. (habits of some Texan solitary wasps). — Peckham and Peckham, 1905. Wasps social and solitary, 311 pp. (prey, nests, life history in Wis.). — Rau and Rau, 1918. Wasp studies afield, 372 pp., 68 figs. (nests, prey, life history in Mo.). — Wheeler, 1919. Amer. Phil. Soc., Proc. 58: 1-40 (evolution of parasitic Aculeata). — Rau, 1922. Acad. Sci. St. Louis, Trans. 24: 1-44 (prey, nests, ecology of Mo. wasps, bees, ants). — Wheeler, 1923. Social Life Among the Insects, 375 pp., 113 figs. — Rau, 1926. Acad. Sci. St. Louis, Trans. 25: 157-277, 8 pls. (ecology of wasps and bees nesting in clay bank in Mo.). — Williams, 1928. Hawaii. Sugar Planters' Assoc. Expt. Sta., Bul. Ent. Ser. 19: 30-60, 112-174 (tropical wasps and bees). — Wheeler, 1928. Social Insects, 378 pp., 79 figs. — Rau, 1928. Acad. Sci. St. Louis, Trans. 35: 325-489, 68 figs. (behavior non-social wasps in Mo.). — Reinhard, 1929. The witchery of wasps, 291 pp., 14 pls., 10 text figs. (prey, nests, life history in Md.). — Rau, 1933. Jungle bees and wasps of Barro Colorado Island, 324 pp. (nests, prey, life history). — Iwata, 1942. Tenthredo 4: 1-46, 5 pls., 1 fig., 2 pp. unnumbered figs. (compar. studies behavior of solitary wasps). — Hurd, 1955. Century of Progress in Natural Sciences, pp. 573-575, Calif. Acad. Sci. (history of wasp taxonomy). — Cooper, 1957. Jour. Expt. Zool. 134: 469-514, 26 figs. (functions of cell partitions in preventing parasitism, predation and cannibalism, and in orienting larva for pupation). — Evans, 1958 (1956). Tenth Internatl. Congr. Ent., Proc. 2: 449-457 (evolution of social life in wasps). — Olberg, 1959. Das Verhalten der solitaeren Wespen Mitteleuropas, 402 pp., 779 photos. (prey, nests). — Evans and Linsley, 1960. South. Calif. Acad. Sci., Bul. 59: 30-37 (sleeping aggregations of aculeates). — Michener, 1961. Roy. Ent. Soc. London, Symp. 1: 43-56 (aspects of social polymorphism). — Krombein, 1962. Ent. Soc. Wash., Proc. 64: 11-19 (parasitism of several wasps and bees by acarid mites). — Linsley, 1962. Ent. Soc. Amer., Ann. 55: 148-164, 9 figs. (sleeping aggregations). — Evans, 1962. Evolution 16: 468-483, 6 figs. (evolution of prey-carrying mechanisms in wasps). — Evans, 1963. Wasp farm, 178 pp., 25 pls., 16 text-figs. (popular account). — Hamilton, 1964. Jour. Theoret. Biol. 7: 1-52 (genetic evolution of social behavior). — Evans, 1966. Ann. Rev. Ent. 11: 123-154, 2 figs. (behavior patterns of solitary wasps). — Krombein, 1967. Trap-nesting wasps and bees: Life histories, nests and associates, 570 pp., 29 pls., 2 text-figs. Cited in text as Trap-nesting wasps and bees. — Andrewes, 1969. The lives of wasps and bees, 204 pp., 16 pls., 15 text-figs. (popular account). — Evans and Eberhard, 1970. The wasps, 265 pp., 122 figs. (synthesis of data on life history, behavior, ecology). — Flanders, 1970. Canad. Ent. 102: 898-905 (cannibalistic infanticide in social Hymenoptera). — Wilson, 1971. Insect societies, 548 pp., figs. (synthesis of insect sociology). — Iwata, 1972 (1971). Evolution of instinct-comparative studies of Hymenoptera behavior, 503 pp., 50 figs. (in Japanese). — Michener and Lin, 1972. Quart. Rev. Biol. 47: 131-159 (evolution of sociality). — Spradbery, 1973. Wasps: an account of the biology and natural history of solitary and social wasps, 408 pp., 28 pls., 131 text figs. — Hamilton, 1973. Ann. Rev. Syst. Ecol. 3: 193-232 (altruism in social insects). — Cazier and Linsley, 1974. Amer. Mus. Novitates 2546: 1-20, 6 figs. (foraging behavior of bees and wasps on *Kallstroemia*). — Schmidt et al., 1974. Sozialpolymorphismus bei Insekten, 974 pp. — Trivers and Hare, 1976. Science 191: 249-263, 7 figs., 6 tabs. (haplodiploidy and evolution of social insects). — Iwata, 1976.

Evolution of Instinct: Comparative Ethology of Hymenoptera, 535 pp., frontisp., 50 figs.  
(English translation, Natl. Tech. Inform. Serv., PB 257052).

## Superfamily BETHYLOIDEA

By KARL V. KROMBEIN

### Family BETHYLIDAE

North American members of this family are tiny or small wasps, rarely over 10 mm long. They are considered to have been derived from a very primitive aculeate stock, and in some features of behavior and development are more like the typical Parasitica rather than the Aculeata. Usually the female stings the host larva a number of times until it is completely and permanently paralyzed. The host larva is left in situ or it may be dragged to a crevice. The bethylid female usually deposits several eggs on each host specimen and the gregarious bethylid larvae develop externally. The Bethylinae and a few Epyrinae prey upon lepidopterous larvae, principally borers and seed-feeders, but also case bearers and leaf rollers. Most of the other bethylids prey upon coleopterous larvae (occasionally pupae), especially species dwelling in the soil, boring in wood or infesting seeds. There have been a few unconfirmed reports of hymenopterous larvae serving as hosts.

Despite Evans' recent numerous revisions of many of the genera of North American Bethylidae, we must expect that intensive, specialized collecting and biological observations in the future will enlarge our native fauna by as much as 50 percent.

Revision: Evans, 1964. Mus. Compar. Zool., Bul. 132: 1-222, 144 figs. (generic reclassification of New World spp.).

Taxonomy: Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 27-77. —Kieffer, 1914. Das Tierreich, Lief. 41, pp. 1-595. —Richards, 1939. Roy. Ent. Soc. London, Trans. 89: 297-344.

Biology: Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 16-20.

Morphology: Reid, 1941. Roy. Ent. Soc. London, Trans. 91: 402-409, figs. 42-44, 46 (female, male thorax).

#### SUBFAMILY BETHYLINAE

##### Genus PROSIEROLA Kieffer

*Prosierola* Kieffer, 1905. In Andre, Spec. Hym. Eur. Alg., v. 9, p. 243.

Type-species: *Epyris* ? *nasalis* Westwood. Monotypic.

*bicarinata* (Brues). Ga., Fla., Tex.; Mexico. Host: *Laspeyresia caryana* (Fitch); *Desmia funeralis* (Hbn.) in leaf rolls.

*Parasierola bicarinata* Brues, 1907. Wis. Nat. Hist. Soc., Bul. 5: 100. ♀.

Biology: Doult, 1973. Ent. Soc. Amer., Ann. 66: 486-487, 1 fig. (brood tending).

Genus *PARASIEROLA* Cameron

*Parasierola* Cameron, 1883. Ent. Soc. London, Trans., p. 197.

Type-species: *Parasierola testaceicornis* Cameron. Monotypic.

*Perisierola* Kieffer, 1914. Das Tierreich, Lief. 41, p. 533.

Type-species: *Parasierola gallicola* Kieffer. Desig. by Muesebeck and Walkley, 1951.

Several species have been reared from microlepidopterous pests such as the pink bollworm and the Oriental fruit moth. Males are uncommon and thelytokous parthenogenesis may be common, four generations of females having been reared from an unfertilized female.

*alutacea* Kieffer. Nev. (Ormsby Co.).

*Parasierola cellularis* var. *alutacea* Kieffer, 1906. Berlin. Ent. Ztschr. 50: 254. ♂.

*breviceps* (Krombein). Calif. (Tracy). Host: *Myelois venipars* Dyar, larva.

*Perisierola breviceps* Krombein, 1954. Pan-Pacific Ent. 30: 259. ♀.

*cellularis* (Say). Pa., N. J., Md., Va., Ohio, Mich., Ind., Iowa, Mo., Nebr., Kans.; Mexico (Nuevo Leon). Host: *Pyrausta ainsliei* Heinr.; *Ancylis comptana fragariae* (W. and R.).

*Bethylus cellularis* Say, 1836. Boston Jour. Nat. Hist. 1: 279.

Biology: Guajardo and Ortiz, 1966. Soc. Nuevoleon Hist. Nat., Bol. 1: 41.

*distinguenda* Kieffer. Calif.; Nicaragua.

*Parasierola distinguenda* Kieffer, 1908. In Wytsman, Gen. Ins., fasc. 76, p. 14. ♀. N. name for the taxon misidentified as *cellularis* (Say) by Kieffer, 1906, Berlin Ent. Ztschr. 50: 254.

*emigrata* (Rohwer). Tex.; Hawaii. Host: *Pectinophora gossypiella* (Saund.).

*Perisierola emigrata* Rohwer, 1917. Insecutor Inscitiae Menstruus 5: 1. ♀, ♂.

Biology: Busck, 1917. Insecutor Inscitiae Menstruus 5: 3-5. — Bridwell, 1919. Hawaii. Ent. Soc., Proc. 4: 21. — Williams, 1927. U. S. Dept. Agr., Tech. Bul. 19: 11.

*gracilicornis* Kieffer. Oreg., Calif., Idaho, Nev., N. Mex., Tex.

*Parasierola cellularis* var. *gracilicornis* Kieffer, 1906. Berlin. Ent. Ztschr. 50: 254. ♀.

*punctaticeps* Kieffer. Calif., Tex. Host: *Laspeyresia caryana* (Fitch); *Acrobasis* sp., *A. caryana* Grt.; *Pectinophora gossypiella* (Saund.).

*Parasierola cellularis* var. *punctaticeps* Kieffer, 1906. Berlin. Ent. Ztschr. 50: 254. ♀.

Biology: Rude, 1937. Jour. Econ. Ent. 30: 840-841. — Nichols, Pierce and Pinkney, 1950. U. S. Dept. Agr., Tech. Bul. 1011: 14.

Genus *GONIOZUS* Foerster

*Goniozus* Foerster, 1856. Hym. Stud., v. 2, p. 96.

Type-species: *Bethylus claripennis* Foerster. Desig. by Ashmead, 1893.

*Progoniozus* Kieffer, 1905. Soc. Sci. Bruxelles, Ann. 29: 105.

Type-species: *Perisemus floridanus* Ashmead. Orig. desig.

Most species whose hosts are known prey on microlepidopterous larvae. North American species have been recorded from a number of economically important hosts. Males may be produced from unfertilized eggs.

Revision: Fouts, 1928. Ent. Soc. Wash., Proc. 30: 127-132.

*brevinervis* Fouts. Ohio, N. J. Host: *Coleophora* sp.; *Aroga trialbamaculella* (Chamb.).

*Goniozus brevinervis* Fouts, 1928. Ent. Soc. Wash., Proc. 30: 127, 128. ♀, ♂.

*castaneicolor* Evans. "United States."

*Bethylus castaneus* Kieffer, 1907. Berlin. Ent. Ztschr. 51: 295. ♀. Preocc. in *Goniozus*.

*Goniozus castaneicolor* Evans, 1964. Mus. Compar. Zool., Bul. 132: 201. N. name.

Taxonomy: Evans, 1962. Breviora, No. 150, p. 1 (generic transfer).

*clarimontis* Kieffer. Calif. (Claremont).

*Goniozus clarimontis* Kieffer, 1906. Berlin. Ent. Ztschr. 50: 253. ♀.



- columbianus** Ashmead, N. J., D. C., Va., Utah. Host: *Ancylis comptana fragariae* (W. and R.), *Rhyacionia buoliana* (Schiff.).  
*Goniozus columbianus* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 76. ♂, ♀.  
*Perisemus minimus* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 71. ♀.
- electus** Fouts. La. (Bogalusa). Host: *Rhyacionia frustrana* (Comst.), *R. buoliana* (Schiff.), *R. spp.*  
*Goniozus electus* Fouts, 1928. Ent. Soc. Wash., Proc. 30: 128, 132. ♀, ♂.
- flavipes** Fouts. Kans. (Junction City).  
*Goniozus flavipes* Fouts, 1928. Ent. Soc. Wash., Proc. 30: 128, 130. ♀, ♂.
- floridanus** (Ashmead). Fla. (Jacksonville).  
*Perisemus floridanus* Ashmead, 1887. Ent. Amer. 3: 76. ♂, ♀.
- foveolatus** Ashmead. Ont. to Fla., west to Sask. and Tex., Ariz. Host: *Acrobasis caryae* Grote; *Polychrosis viteana* (Clem.); *Coleophora malivorella* Riley; *Ancylis comptana fragariae* (W. and R.); *Anchylopera nubeculana* Clem.; *Grapholitha molesta* (Busck); *Acrobasis caryivorella* Rag.; *Gracilaria negundella* Chamb.; *Nemapogon granella* (L.); *Laspeyresia caryana* (Fitch); *Rhyacionia buoliana* (Schiff.).  
*Goniozus foveolatus* Ashmead, 1887. Ent. Amer. 3: 76. ♀.  
*Goniozus hortorum* Brues, 1907. Wis. Nat. Hist. Soc., Bul. 5: 150. ♀.
- Morphology: Snodgrass, 1941. Smithsn. Inst., Misc. Collect. 99, No. 14: 44-46, pl. 15, figs. E, F (male genitalia).
- gallicola** Fouts. Oreg., Calif. Host: *Deoclona yuccasella* Busck in Yucca seed pods; *Melissopus latiferreanus* (Wlsm.)? in galls of *Cynips maculipennis* Gill.  
*Goniozus gallicola* Fouts, 1942. Ent. Soc. Wash., Proc. 44: 168. ♀.
- Biology: Fouts, 1942. Ent. Soc. Wash., Proc. 44: 168 (host ?). —Gordh, 1976. U. S. Dept. Agr., Tech. Bul. 1524: 1-27, 5 figs. (behavior, life history, host).
- hubbardi** Howard. Fla. Host: *Platynota rostrana* (Wlkr.); *Platoeceticus gloveri* Pack.  
*Goniozus hubbardi* Howard, 1885. In Hubbard, Ins. Affecting the Orange, p. 217. ♀.
- longiceps** Kieffer. Tex. Host: *Rhyacionia bushnelli* (Busck), *R. buoliana* (Schiff.), *R. spp.*  
*Goniozus longiceps* Kieffer, 1904. Arkiv for Zool. 1: 529. ♀.
- longinervis** Fouts. Nebr., S. Dak., Calif. Host: *Rhyacionia bushnelli* (Busck), *R. spp.*, *Argyrotaenia citrana* (Fern.).  
*Goniozus longinervis* Fouts, 1928. Ent. Soc. Wash., Proc. 30: 128, 131. ♀, ♂.
- megacephalus** Ashmead. Fla. (Key West).  
*Goniozus megacephalus* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 74. ♀.  
*Goniozus megalcephalus* Schulz, 1906. Spolia Hym., p. 152. Emend.
- mellipes** (Ashmead). Fla. (Jacksonville).  
*Perisemus mellipes* Ashmead, 1887. Ent. Amer. 3: 76. ♀.
- occipitalis** Kieffer. Nev., Calif.  
*Goniozus occipitalis* Kieffer, 1906. Berlin. Ent. Ztschr. 50: 252. ♀.
- platynotae** Ashmead. Conn., N. Y., to Fla. west to Kans. and La., also Utah and Ariz.; Puerto Rico. Host: *Platynota idaeusalis* (Wlkr.); *P. flavedana* Clem.; *P. stultana* Wlsh.; *Archips argyrosipila* (Wlkr.); *A. griseus* (Robinson); *A. rosaceana* (Harr.); *Archips sp.*; *Coelostathma discopunctana* Clem.?; *Sparganothis sulphurana* (F.); *Canarsia sp.*; *Argyrotaenia velutinana* (Wlkr.); *Pandemis limitata* Rob.; *Acrobasis caryae* Grote; *Ancylis comptana fragariae* (W. and R.); *Agathodes desigualis* Guen. Parasite: *Perilampus fulvicornis* Ashm. (secondary).  
*Goniozus platynotae* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 75. ♂, ♀.  
*Goniozus euliae* Fouts, 1926. Ent. Soc. Wash., Proc. 28: 167. ♀, ♂.
- Biology: Fouts, 1928. Ent. Soc. Wash., Proc. 30: 129. —Wolcott, 1948. Puerto Rico Univ. Jour. Agr. 32: 848. —Bennett, 1961. Tenn. Acad. Sci., Jour. 36: 353. —Oatman and Jenkins, 1962. Mo. Univ. Coll. Agr., Res. Bul. 789: 12. —Wilde and Semel, 1966. Jour. Econ. Ent. 59: 1040. —Krombein, 1967. Trap-nesting Wasps and Bees, p. 69. —Prokopy, 1968. Jour. Econ. Ent. 61: 351. —Goertzen and Douth, 1975. Ent. Soc. Amer., Ann. 68: 869-870 (female oviductal behavior).

**politus** Ashmead. Md. (Virginia Beach).

*Goniozus politus* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 75. ♀.

### Genus BETHYLUS Latreille

*Bethylus* Latreille, 1802-03. Hist. Nat. Crust. Ins., v. 3, p. 315.

Type-species: *Omalus fuscicornis* Jurine. Desig. by Internatl. Comn. Zool. Nomencl. Op. 153, 1944.

*Perisemus* Foerster, 1856. Hym. Stud., v. 2, pp. 95, 96.

Type-species: *Perisemus triareolatus* Foerster. Monotypic.

*Episemus* Thomson, 1862. Ofvers. k. Vetensk. Akad. Forh. 18: 452.

Type-species: *Episemus variabilis* Thomson. Desig. by Richards, 1939.

*Digoniozus* Kieffer, 1905. In Andre, Spec. Hym. Eur. Alg., v. 9, p. 245.

Type-species: *Perisemus oregonensis* Ashmead. Monotypic.

Species of this genus prey upon larvae of Microlepidoptera, although there is a questionable host record for a nitidulid beetle larva. Both sexes exhibit polymorphism in wing length, and no fully winged North American specimens are known.

Revision: Evans, 1962. Breviora, No. 150, 12 pp., 3 figs., 1 map.

**amoenus** Fouts. N. W. T. south to Alta., east through Wis. and Ill. to N. Y., Maine, and N. S.

Host: *Rhopobata naevana* (Hbn.); ? *Brachypterolus pulicarius* (L.).

*Bethylus amoenus* Fouts, 1928. Ent. Soc. Wash., Proc. 30: 127. ♀, ♂.

**decipiens** (Provancher). Alaska south to central Calif. eastward to N. Y., Maine and N. S.

Host: *Cnephasia* sp.

*Gonatopus decipiens* Provancher, 1887. Addit. Corr. Faune Ent. Canada Hym., p. 179. ♀.

*Perisemus oregonensis* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 70. ♀.

*Arysepyris californicus* Bridwell, 1919. Hawaii. Ent. Soc., Proc. 4: 34. ♀.

*Bethylus brachypterus* Whittaker, 1928. Ent. Soc. London, Trans. 2: 385. ♀.

*Bethylus flavicornis* Whittaker, 1928. Ent. Soc. London, Trans. 2: 385. ♂, ♀.

## SUBFAMILY EPYRINAE

### TRIBE EPYRINI

#### Genus RHABDEPYRIS Kieffer

Hosts of the American species are unknown. Two European species have been taken in ant nests, but the association is probably fortuitous.

Revision: Evans, 1965. Mus. Compar. Zool., Bul. 133: 67-151, 7 pls.

#### Genus RHABDEPYRIS Subgenus RHABDEPYRIS Kieffer

*Rhabdepyris* Kieffer, 1904. Soc. Hist. Nat. Metz., Bul. (2)11: 32.

Type-species: *Rhabdepyris myrmecophilus* Kieffer. Desig. by Kieffer, 1906.

**gracilis** Evans. Calif.; Mexico (Durango).

*Rhabdepyris (Rhabdepyris) gracilis* Evans, 1965. Mus. Compar. Zool., Bul. 133: 76. ♀, ♂.

**mellipes** Evans. Fla. (Orange Co.).

*Rhabdepyris (Rhabdepyris) mellipes* Evans, 1965. Mus. Compar. Zool., Bul. 133: 72, fig. 1. ♀.

**muesebecki** Evans. Tex. (Brownsville); Mexico, Honduras, Costa Rica, Ecuador, Bolivia.

*Rhabdepyris (Rhabdepyris) muesebecki* Evans, 1965. Mus. Compar. Zool., Bul. 133: 74. ♀, ♂.

**nigripilosus** (Ashmead). Ariz. (Huachuca Mts.); Mexico (Nayarit).

*Mesitius nigripilosus* Ashmead, 1895. Calif. Acad. Sci., Proc. (2)5: 539. ♀.

*Rhabdepyris (Rhabdepyris) huachucae* Evans, 1965. Mus. Compar. Zool., Bul. 133: 73. ♀.

Taxonomy: Evans, 1965. Psyche 72: 268.

**Genus RHABDEPYRIS Subgenus TRICHOTEPYRIS Kieffer**

*Rhabdepyris* subg. *Trichotepyrus* Kieffer, 1906. In Andre, Spec. Hym. Eur. Alg., v. 9, p. 376.

Type-species: *Rhabdepyris pallidipennis* Kieffer. Desig. by Muesebeck and Walkley, 1951.

## SPECIES GROUP MEGACEPHALUS

**angusticeps** Evans. Ariz. (Tucson).

*Rhabdepyris (Trichotepyrus) angusticeps* Evans, 1965. Mus. Compar. Zool., Bul. 133: 102, figs. 8, 48. ♀.

**apache** Evans. Ariz. (Pima Co.); Mexico (Sonora, Sinaloa, Nayarit, Jalisco).

*Rhabdepyris (Trichotepyrus) apache* Evans, 1965. Mus. Compar. Zool., Bul. 133: 91, figs. 5, 26. ♀, ♂.

**carolinianus** Evans. S. C., Fla.

*Rhabdepyris (Trichotepyrus) carolinianus* Evans, 1965. Mus. Compar. Zool., Bul. 133: 100, figs. 7, 28, 46. ♀.

**megacephalus** (Ashmead). Tex., N. Mex., Ariz., Calif.

*Epyris megacephalus* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 61. ♀.

*Epyris megalcephala* Schulz, 1906. Spolia Hym., p. 153. Emend.

**texanus** Evans. Tex., Ariz.; Mexico (Sonora, Sinaloa, Morelos).

*Rhabdepyris (Trichotepyrus) texanus* Evans, 1965. Mus. Compar. Zool., Bul. 133: 93, figs. 6, 18, 27. ♀, ♂.

**wernerii** Evans. Ariz. (Gila Co., Pima Co.); Mexico (Chihuahua).

*Rhabdepyris (Trichotepyrus) wernerii* Evans, 1965. Mus. Compar. Zool., Bul. 133: 89, figs. 4, 17, 25, 44. ♀, ♂.

## SPECIES GROUP PULCHRIPENNIS

**amabilis** Fouts. Mass., N. Y., Md., D. C., Va., Fla., Ark., Mo.

*Rhabdepyris amabilis* Fouts, 1927. Ent. Soc. Wash., Proc. 29: 165. ♀.

**Genus RHABDEPYRIS Subgenus CHLOREPYRIS Kieffer**

*Chlorepyris* Kieffer, 1913. Lab. Zool. Gen. e Agr. Portici, Bol. 7: 108.

Type-species: *Epyris semiviridis* Kieffer. Desig. by Kieffer, 1914.

## SPECIES GROUP VIRIDISSIMUS

**fulgens** (Brues). Tex. (Brownsville); Honduras.

*Epyris fulgens* Brues, 1907. Wis. Nat. Hist. Soc., Bul. 5: 99. ♀.

**Genus ANISEPYRIS Kieffer**

*Anisepyris* Kieffer, 1905. In Andre, Spec. Hym. Eur. Alg., v. 9, p. 248.

Type-species: *Epyris amazonicus* Westwood. Monotypic.

*Rhabdepyris* subg. *Lophepyris* Evans, 1959. Ent. Soc. Wash., Proc. 61: 201.

Type-species: *Rhabdepyris (Lophepyris) bridwelli* Evans. Orig. desig.

Revision: Evans, 1959. Ent. Soc. Wash., Proc. 61: 97-120, 28 figs. (U. S. species). — Evans, 1959. Ent. Soc. Wash., Proc. 61: 201-204 (*Lophepyris*). — Evans, 1966. Studia Ent. 9: 1-120, 151 figs. (New World species).

## SPECIES GROUP AENEUS

The Aeneus Species Group is equivalent to subgenus *Lophepyris* Evans.

**aeneus** Kieffer. Southern Tex. to Panama.

*Anisepyris aeneus* Kieffer, 1906. Soc. Sci. Bruxelles, Ann. 30: 138. ♀.

*Anisepyris sublevis* Kieffer, 1906. Soc. Sci. Bruxelles, Ann. 30: 140. ♂.

*Rhabdepyris (Lophepyris) bridwelli* Evans, 1959. Ent. Soc. Wash., Proc. 61: 202. ♀, ♂.

**bradleyi** (Evans). Fla., Tex.

*Rhabdepyris (Lophepyris) bradleyi* Evans, 1959. Ent. Soc. Wash., Proc. 61: 204. ♀.

## SPECIES GROUP AURICALCEUS

- aurichalceus** (Westwood). Fla. (Miami); Cuba, Puerto Rico, St. Thomas, St. Kitts.  
*Epyris aurichalceus* Westwood, 1874. Thesaurus Ent. Oxon., p. 160, pl. 31, fig. 3. ♀.  
*Anisepyris viridis* Kieffer, 1907. Soc. Sci. Bruxelles, Ann. 32: 12. ♂. Preocc.  
*Anisepyris viridellus* Kieffer, 1914. Das Tierreich, Lief. 41, p. 438. N. name.  
*Anisepyris cubensis* Fouts, 1928. Ent. Soc. Wash., Proc. 30: 125. ♀.

## SPECIES GROUP PROTEUS

- arapaho** Evans. Tex. (Culberson Co.).  
*Anisepyris arapaho* Evans, 1966. Studia Ent. 9: 62, figs. 44, 65. ♀.  
**dietrichorum** Evans. Southern Ariz.; Mexico (Sinaloa, Nayarit, Jalisco, Veracruz).  
*Anisepyris dietrichorum* Evans, 1959. Ent. Soc. Wash., Proc. 61: 118, fig. 21. ♀.  
**papago** Evans. Ariz. (Pima Co.).  
*Anisepyris papago* Evans, 1966. Studia Ent. 9: 63, fig. 45. ♀.  
**rugosicollis** Brues. Tex. (Brownsville).  
*Anisepyris rugosicollis* Brues, 1908. Wis. Nat. Hist. Soc., Bul. (2) 6: 48. ♀.

## SPECIES GROUP OCCIDENTALIS

- arizonicus** Evans. Ariz. (Pima Co., Cochise Co.).  
*Anisepyris arizonicus* Evans, 1959. Ent. Soc. Wash., Proc. 61: 112, fig. 15. ♀.  
**gibbosifrons** Evans. N. J., Fla.  
*Anisepyris gibbosifrons* Evans, 1959. Ent. Soc. Wash., Proc. 61: 116, figs. 23, 25, 26. ♀, ♂.  
**laticeps** Evans. Southeastern Ariz.  
*Anisepyris laticeps* Evans, 1959. Ent. Soc. Wash., Proc. 61: 113, figs. 18, 19, 24. ♀, ♂.  
*Anisepyris latifrons* (!) Evans, 1959. Ent. Soc. Wash., Proc. 61: 115, fig. 24 legend. Lapsus.  
**occidentalis** (Ashmead). Wash., Oreg., Idaho, Utah, Nev., Calif., Ariz.; Mexico (Aguaascalientes, Guadalajara, Guerrero, Chiapas).  
*Epyris occidentalis* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 58, 59. ♂, ♀.  
*Anisepyris punctaticeps* Kieffer, 1906. Soc. Sci. Bruxelles, Ann. 30: 139. ♂.  
**subviolaceus** Kieffer. Mass., Mich., Alta. and B. C. south to Fla., Tex. and Ariz.; Mexico (Sinaloa, Nayarit, Morelos, Veracruz).  
*Anisepyris subviolaceus* Kieffer, 1910. Soc. Ent. France, Ann. 79: 39. ♀.

## SPECIES GROUP COLUMBIANUS

- columbianus** (Ashmead). Idaho and Wash. south through Ariz. and Calif. to Costa Rica.  
*Epyris columbianus* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 58, 60. ♂, ♀.  
*Anisepyris pulchellus* Fouts, 1928. Ent. Soc. Wash., Proc. 30: 126. ♀.  
**grandis** (Ashmead). Fla.  
*Goniozus grandis* Ashmead, 1887. Ent. Amer. 3: 76. ♂, ♀.  
*Epyris aeneiceps* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 59. ♀..  
**williamsi** Evans. Utah, Idaho and Oreg., south through Ariz. and Calif. to southern Mexico.  
*Anisepyris williamsi* Evans, 1959. Ent. Soc. Wash., Proc. 61: 106, fig. 9. ♀, ♂.

## SPECIES GROUP AMAZONICUS

- analis** (Cresson). N. C. to Fla., Tenn., Tex.; Mexico (Hidalgo).  
*Epyris analis* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 193. ♀.

## Genus EPYRIS Westwood

- Epyris* Westwood, 1832. London, Edinb. and Dublin Phil. Mag. and Jour. (ser. 3) 1 (2): 129.  
 Type-species: *Epyris niger* Westwood. Monotypic.  
*Muellerella* Saussure, 1892. In Grandidier, Hist. Nat. Madagascar 20: pl. 25, fig. 20.  
 Type-species: *Muellerella amabilis* Saussure. Monotypic.  
*Empyris* (!) Melander and Brues, 1903. Biol. Bul. 5: 23.  
*Parepyris* Kieffer, 1913. Lab. Zool. Gen. e Agr. Portici, Bol. 7: 108.  
 Type-species: *Epyris interruptus* Kieffer. Desig. by Kieffer, 1914.  
*Psilepyris* Kieffer, 1913. Lab. Zool. Gen. e Agr. Portici, Bol. 7: 108.  
 Type-species: *Epyris indivisus* Kieffer. Desig. by Kieffer, 1914.

Several species are known to parasitize soil-dwelling beetle larvae, especially Tenebrionidae. A few species hibernate gregariously beneath or in bark of trees. Several species of which *E. californicus* (Ashm.) is an example, have a very painful sting and can cause severe allergic reactions in humans.

Revision: Evans, 1969. Amer. Ent. Soc., Trans. 95: 181-352, 168 figs., 24 maps (New World species).

#### SPECIES GROUP CONNEXUS

**connexus** Evans. Southern Ariz. and Calif.

*Epyris connexus* Evans, 1967. Ent. News 78: 97. ♀, ♂.

**spissus** Evans. Ont., Mass., south to Fla.

*Epyris spissus* Evans, 1969. Amer. Ent. Soc., Trans. 95: 193, figs. 1, 3, 7, map 1. ♀, ♂.

#### SPECIES GROUP TRICOSTATUS

**cariniceps** Evans. Central Calif., southern Ariz., western Tex. to Costa Rica.

*Epyris cariniceps* Evans, 1969. Amer. Ent. Soc., Trans. 95: 216, figs. 17, 41, 49, map 5. ♀, ♂.

**erigoni** Kieffer. Calif., Ariz., N. Mex., Tex. south to Veracruz.

*Epyris erigoni* Kieffer, 1906. Berlin. Ent. Ztschr. 50: 245. ♂.

*Epyris erigoni* (!) Brues, 1907. Wis. Nat. Hist. Soc., Bul. 5: 97.

Taxonomy: Evans, 1969. Amer. Ent. Soc., Trans. 95: 220, figs. 22, 25, 40, 50, map 6. ♀, ♂.

**oriplanus** Kieffer. Va. to Fla., Tex. to Calif., south to Chiapas.

*Epyris oriplanus* Kieffer, 1911. Soc. Sci. Bruxelles, Ann. 35: 228. ♀.

Taxonomy: Evans, 1969. Amer. Ent. Soc., Trans. 95: 213, figs. 10, 11, 19, 33, 34, map 4. ♀, ♂.

**tricostatus** Evans. Pa. to Fla., Kans., Tex.

*Epyris tricostatus* Evans, 1969. Amer. Ent. Soc., Trans. 95: 208, figs. 16, 39, 47, map 3. ♀, ♂.

**vogti** Evans. Md. (Nanjemoy).

*Epyris vogti* Evans, 1969. Amer. Ent. Soc., Trans. 95: 211, fig. 24, map 5. ♀.

#### SPECIES GROUP RUFIPES

**brachypterus** (Ashmead). Md., D. C., Va., "Carolina".

*Mesitius brachypterus* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 66. ♀.

Taxonomy: Evans, 1969. Amer. Ent. Soc., Trans. 95: 273, map 11. ♀.

**californicus** (Ashmead). Pa. to Fla., Ill., Kans., Colo., Tex., Oreg., Calif. and Ariz. south to Honduras.

*Mesitius californicus* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 65. ♀.

*Mesitius minutus* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 65. ♂.

Taxonomy: Evans, 1969. Amer. Ent. Soc., Trans. 95: 260, figs. 63, 64, 72, 98-101, map 10. ♀, ♂.

Biology: Essig and Michelbacher, 1932. Science 76: 407-408.

**clarimontis** Kieffer. Fla., N. Dak. to Wash. south to Calif. and Tex., thence to central Mexico.

*Epyris clarimontis* Kieffer, 1906. Berlin. Ent. Ztschr. 50: 243. ♀.

*Epyris indivisus* Kieffer, 1905. Berlin. Ent. Ztschr. 50: 243. ♂.

Taxonomy: Evans, 1969. Amer. Ent. Soc., Trans. 95: 280, figs. 73, 74, 75, 86, 108-111, map 14. ♀, ♂.

**cochise** Evans. Idaho, Utah, Nev., Ariz., N. Mex., Tex.

*Epyris cochise* Evans, 1969. Amer. Ent. Soc., Trans. 95: 285, figs. 84, 85, 114, map 15. ♂, ♀.

**deficiens** Krombein. N. Y. to Ga., W. Va., ?Kans.

*Epyris deficiens* Krombein, 1956. Ent. Soc., Wash., Proc. 58: 156, fig. 3. ♀.

Taxonomy: Evans, 1969. Amer. Ent. Soc., Trans. 95: 288, figs. 68, 69, 78, 115, map 15. ♀, ♂.

**guatemalensis** Cameron. Southern Calif. through western and central Mexico to Guatemala.

*Epyris guatemalensis* Cameron, 1888. Biol. Cent.-Amer., Hym. 1: 453, pl. 19, fig. 20. ♀.

- Epyris guatemalensis* (!) Evans, 1969. Amer. Ent. Soc., Trans. 95: 264, fig. 104, map 17. ♀, ♂.
- monticola** (Ashmead). Colo.; Mexico (Durango).  
*Epyris monticola* Ashmead, 1890. Colo. Biol. Assoc., Bul. 1: 8. ♂.
- Taxonomy: Evans, 1969. Amer. Ent. Soc., Trans. 95: 256, figs. 58, 59, 96, map 16. ♂.
- myrmecophilus** (Brues). Vt., Wis. and Colo. south to Fla., Tex., Ariz., southern Calif.  
*Mesitius myrmecophilus* Brues, 1903. Amer. Ent. Soc., Trans. 29: 124. ♀.
- Taxonomy: Evans, 1969. Amer. Ent. Soc., Trans. 95: 269, figs. 65, 105, 107, map 12. ♀, ♂.
- rufipes** (Say). Que., B. C., U. S. south at higher elevations to Guatemala.  
*Bethylus rufipes* Say, 1824. In Keating, Narr. Long's 2nd Exped., v. 2, p. 329. ♀ (?).  
*Bethylus formicoides* Provancher, 1887. Addit. Corr. Faune Ent. Canada Hym., p. 179. ♀.  
*Epyris rufipes* Cameron, 1888. Manchester Lit. and Phil. Soc., Mem. and Proc. 1: 173. ♀.  
 Preoce.
- Epyris montezuma* Cameron, 1888. Manchester Lit. and Phil. Soc., Mem. and Proc. Errata 1: vii. N. name.
- Mesitius vancouverensis* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 64. ♀.  
*Mesitius nevadensis* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 64. ♀.  
*Mesitius bifoveolatus* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 66. ♂, ♀.  
*Epyris longicollis* Kieffer, 1906. Berlin. Ent. Ztschr. 50: 244. ♀. Preoce.  
*Epyris nudicornis* Kieffer, 1906. Berlin. Ent. Ztschr. 50: 245. ♂.  
*Epyris gracilicollis* Kieffer, 1908. In Wytsman, Gen. Ins., fasc. 76, p. 28. N. name.
- Taxonomy: Evans, 1969. Amer. Ent. Soc., Trans. 95: 250, figs. 53, 54, 91-94, 97, map 9. ♀, ♂.
- sculleni** Evans. Alta., Wash., Idaho, Utah, Oreg., Calif., Ariz., N. Mex.; Mexico (Hidalgo).  
*Epyris sculleni* Evans, 1969. Amer. Ent. soc., Trans. 95: 266, figs. 66, 67, 82, 102, 103, map 11. ♂, ♀.
- sepulchralis** Evans. Mass., Md., Fla., Tenn., Okla., Tex., southern Calif.; Mexico (Guanajuato, Jalisco, Veracruz).  
*Epyris sepulchralis* Evans, 1969. Amer. Ent. Soc., Trans. 95: 275, figs. 76, 79, 80, 112, map 13. ♂, ♀.
- texanus** (Ashmead). N. Y., Va., N. C., Ill., Tex.  
*Mesitius texanus* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 67. ♀.
- Taxonomy: Evans, 1969. Amer. Ent. Soc., Trans. 95: 290, map 16. ♀.
- vierecki** Krombein. Mass., N. Y., Md., Va., W. Va., N. C., S. C., Ga.  
*Epyris vierecki* Krombein, 1962. Biol. Soc. Wash., Proc. 75: 1. ♂, ♀.
- Taxonomy: Evans, 1969. Amer. Ent. Soc., Trans. 95: 277, figs. 77, 81, 106, map 14. ♀, ♂.

## SPECIES GROUP DEPRESSIGASTER

- alachua** Evans. Fla. (Alachua Co.).  
*Epyris alachua* Evans, 1969. Amer. Ent. Soc., Trans. 95: 337, fig. 153, map 22. ♀.
- corticinus** Evans. Pa., Md., Va.  
*Epyris corticinus* Evans, 1969. Amer. Ent. Soc., Trans. 95: 338, figs. 148, 149, map 22. ♀.
- festivus** Evans. Fla. (Lake Co., Dixie Co.).  
*Epyris festivus* Evans, 1969. Amer. Ent. Soc., Trans. 95: 339, map 22. ♀.

## SPECIES GROUP IDIONOTUM

- idionotum** Evans. Fla.  
*Epyris idionotum* Evans, 1969. Amer. Ent. Soc., Trans. 95: 340, figs. 146, 156, map 23. ♂.

## NOMEN NUDUM IN EPYRIS WESTWOOD

- Epyris monticola* Ashmead in Cockerell, 1889. Colo. Biol. Assn., 10th Rept., [p. 2] (probably published originally in Custer County Courant newspaper).

## Genus BAKERIELLA Kieffer

- Bakeriella* Kieffer, 1910. Soc. Ent. France, Ann. 78: 288.  
 Type-species: *Bakeriella flavicornis* Kieffer. Monotypic.

**floridana** Evans. Fla. (Paradise Key).

*Bakeriella floridana* Evans, 1964. Mus. Compar. Zool., Bul. 132: 134, fig. 84. ♂, ♀.

### Genus **HOLEPYRIS** Kieffer

*Holepyris* Kieffer, 1904. Mus. Civ. Stor. Nat. Genova, Ann. 41: 390.

Type-species: *Holepyris africanus* Kieffer. Desig. by Kieffer, 1906.

*Holepyris* subg. *Rysepyris* Kieffer, 1906. In Andre, Spec. Hym. Eur. Alg., v. 9, p. 341.

Type-species: *Holepyris (Rysepyris) numidicus* Kieffer. Desig. by Kieffer, 1914.

*Misepyris* Kieffer, 1913. Lab. Zool. Gen. e Agr. Portici, Bol. 7: 108.

Type-species: *Holepyris remotus* Kieffer. Desig. by Kieffer, 1914.

*Parepyris* Brethes, 1913. Buenos Aires Mus. Nac. de Hist. Nat., An. 24: 87.

Type-species: *Parepyris sylvanidis* Brethes. Monotypic.

Authenticated host records indicate that members of this genus parasitize coleopterous larvae, although in the laboratory they can be induced to attack Microlepidoptera also. One North American species attacks larvae infesting grain, and another was reared from a beetle larva beneath bark.

**coronatus** (Ashmead). Md. (Bladensburg). Host: *Catogenus rufus* (F.).

*Apenesia coronata* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 47. ♂.

**floridanus** (Ashmead). Fla.

*Isobrachium floridanum* Ashmead, 1887. Ent. Amer. 3: 76. ♂.

**haemorrhoidalis** (Kieffer). Tex.

*Rhabdepyris haemorrhoidalis* Kieffer, 1904. Arkiv. for Zool. 1: 528. ♀.

**marylandicus** Fouts. Md., N. C.

*Holepyris marylandicus* Fouts, 1928. Ent. Soc. Wash., Proc. 30: 125. ♀.

**punctifrons** Fouts. Fla. (Hawthorne).

*Holepyris punctifrons* Fouts, 1927. Ent. Soc. Wash., Proc. 29: 166. ♀.

**subapterus** (Melandar and Brues). Mass.

*Empyris* (!) *subapterus* Melander and Brues, 1903. Biol. Bul. 5: 23. ♀.

**sylvanidis** (Brethes). Widespread in U. S.; cosmopolitan. Host: *Oryzaephilus surinamensis*

(L.); *Sitophilus oryza* (L.); *Tribolium castaneum* (Hbst.); *T. confusum* Duv.;

*Laemophloeus ferrugineus* (Steph.).

*Parepyris sylvanidis* Brethes, 1913. Buenos Aires Mus. Nac. de Hist. Nat., An. 24: 87. ♂, ♀.

*Rhabdepyris zaeae* Turner and Waterson, 1921. Rpt. Grain Pests (War) Com. [Gt. Brit.], No. 9, p. 29. ♀.

### Genus **LAELIUS** Ashmead

*Laelius* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 50.

Type-species: *Laelius trogodermatis* Ashmead. Orig. desig.

*Paralaelius* Kieffer, 1905. Soc. Sci. Bruxelles, Ann. 29: 129.

Type-species: *Bethylus pedatus* Say. Desig. by Kieffer, 1914.

All authenticated host records for North American *Laelius* are larvae of Dermestidae, usually in and around buildings.

Revision: Muesebeck, 1939. Biol. Soc. Wash., Proc. 52: 171-176.

**centratus** (Say). Fla., Ind., Colo.

*Bethylus centratus* Say, 1836. Boston Jour. Nat. Hist. 1: 281.

**occidentalis** Whittaker. B. C. (Chilliwack).

*Laelius occidentalis* Whittaker, 1928. Ent. Soc. London, Trans. p. 387. ♀.

**pedatus** (Say). N. J., N. Y., D. C., Va., S. C., Fla., Ind., Colo. south to Mexico (Morelos). Host:

*Anthrenus verbasci* (L.).

*Bethylus pedatus* Say, 1836. Boston Jour. Nat. Hist. 1: 280.

*Ateleopecterus nubilipennis* Ashmead, 1887. Ent. Amer. 3: 97. ♀.

*Laelius tricarinatus* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 51. ♂, ♀.

*Laelius rufipes* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 51. ♀. Preocc.

*Laelius nigripilosus* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 52. ♂, ♀.

*Bethylus constrictus* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 53. ♀.

*Laelius ashmeadi* Kieffer, 1908. In Wytzman, Gen. Ins., fasc. 76, p. 38. N. name.

*Laelius fumipennis* Brues, 1910. Wis. Nat. Hist. Soc., Bul. (Ser. 2) 8: 45. ♀.

**trogodermatis** Ashmead. Que., N. Y., D. C., Va., Fla. Host: *Trogoderma parabile* Beal, *T. simplex* Jayne, *T. versicolor* Creutz.

*Laelius trogodermatis* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 51. ♂, ♀.

Biology: Howard, 1901. The Insect Book, pp. 34-36, fig. 18. — Krombein, 1955. Brooklyn Ent. Soc., Bul. 50: 13-14.

**utilis** Cockerell. Ont., Mass., Md., D. C., Va., N. C. Host: *Trogoderma versicolor* Creutz.; *Bruchus brachialis* Fahr.?

*Laelius utilis* Cockerell, 1920. Canad. Ent. 52: 34. ♀.

**voracis** Muesebeck. D. C., Va.; India. Host: *Anthrenus vorax* (Waterh.).

*Laelius voracis* Muesebeck, 1939. Biol. Soc. Wash., Proc. 52: 172. ♀, ♂.

Biology: Back, 1940. Ent. Soc. Wash., Proc. 42: 110-113, 1 pl. — Kurian, 1954. Agra Univ., Jour. Res. (Sci.) 3: 422, figs. 9-13.

### TRIBE CEPHALONOMIINI

#### Genus PLASTANOXUS Kieffer

*Plastanoxus* Kieffer, 1905. In Andre, Spec. Hym. Eur. Alg., v. 9, p. 244.

Type-species: *Anoxus chittendenii* Ashmead. Desig. by Gahan, 1931.

These tiny wasps are parasitic on coleopterous larvae.

Revision: Gahan, 1931. Wash. Acad. Sci., Jour. 21: 213-218, figs. 1-3.

Taxonomy: Evans, 1964. Mus. Compar. Zool., Bul. 132: 151-152 (key to species).

**chittendenii** (Ashmead). Transcontinental in southern Canada and U. S.; adventive in England.

Host: *Cis fuscipes* Mellie?

*Anoxus Chittendenii* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 68. ♂.

**incompletus** Evans. Ariz. (Mesa).

*Plastanoxus incompletus* Evans, 1964. Mus. Compar. Zool., Bul. 132: 152. ♀.

**laevis** (Ashmead). D. C.; ?Brazil.

*Anoxus laevis* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 68. ♀.

**westwoodi** (Kieffer). D. C., Ga.; probably cosmopolitan. Host: *Laemophloeus pusillus* (Schonh.).

*Cephalonomia westwoodi* Kieffer, 1914. Das Tierreich, Lief. 41, p. 248. ♂, ♀.

*Plastanoxus kiefferi* Gahan, 1931. Wash. Acad. Sci., Jour. 21: 217. ♀, ♂ (? *Lapsus* for *westwoodi*.)

#### Genus CEPHALONOMIA Westwood

*Cephalonomia* Westwood, 1853. Mag. Nat. Hist. 6: 420.

Type-species: *Cephalonomia formiciformis* Westwood. Monotypic.

*Holopedina* Foerster, 1850. Naturh. Ver. Rheinlande Verh. 7: 502.

Type-species: *Holopedina polypori* Foerster. Monotypic.

*Cephalonomia* subg. *Cephaloderma* Hoffer, 1936. Festchr. Embrik Strand, v. 1, p. 459.

Type-species: *Cephalonomia* (*Cephaloderma*) *strandii* Hoffer. Monotypic.

So far as known these tiny wasps parasitize the larvae or pupae of small Coleoptera occurring in cryptic situations. One group attacks pests of stored grains, another parasitizes Ciidae occurring in fungi, and the third attacks bark beetles. Four types of species may be distinguished based on development of the wings in both sexes: One in which both sexes are macropterous; one in which the males are macropterous, the females macropterous or brachypterous; a third in which the males are macropterous or apterous and the females apterous; and the last in which the males are macropterous or apterous, the females macropterous, micropterous or apterous.

Biology: Evans, 1964. Mus. Compar. Zool., Bul. 132: 158-159.



- Morphology: Grandi, 1929. Bol. Lab. Ent. Bologna 2: 301-314. — van Emden, 1931. Ztschr. f. Morph. u. Oekol. der Tiere 23: 425-574. — Grandi, 1932. Bol. Lab. Ent. Bologna 5: 13-21.
- cynipsiphila** (Ashmead). Fla.  
*Sclerochroa cynipsiphila* Ashmead, 1887. Ent. Amer. 3: 75. ♀.
- gallicola** (Ashmead). Widely distributed in North America; probably cosmopolitan. Host: *Stegobium paniceum* (L.); *Lasioderma serricorne* (F.); *Ptinus* sp.; *Araecerus fasciculatus* de Geer.  
*Sclerochroa gallicola* Ashmead, 1887. Ent. Amer. 3: 75. ♀.  
*Holopedina nubilipennis* Ashmead, 1887. Ent. Amer. 3: 97. ♀.  
*Cephalonomia rambeui* Giard, 1898. Soc. Ent. France, Bul., p. 50. ♀, ♂.  
*Cephalonomia quadridentata* Duchaussoy, 1917. Soc. Hist. Nat. Afrique du Nord, Bul. 9: 111. ♀.  
*Cephalonomia caesarorum* van Emden, 1931. Ztschr. Morph. u. Oekol. Tiere 23: 431.  
*Cephalonomia (Cephaloderma) strandi* Hoffer, 1936. Festschr. Embrik Strand, v. 1, p. 460. ♀.
- Biology: van Emden, 1931. Ztschr. Morph. u. Oekol. Tiere 23: 425-574. — Kearns, 1934. Jour. Econ. Ent. 27: 801-806. — Kearns, 1934. Ent. Soc. Amer., Ann. 27: 533-541. — Cabal Concha, 1956. Rev. Facult. Nac. Agron. [Colombia] 18: 64.
- Morphology: van Emden, 1931. Ztschr. Morph. u. Oekol. Tiere 23: 425-574. — Grandi, 1932. Lab. Ent. R. Ist. Sup. Agr. Bologna, Bol. 5: 113-115. — Reid, 1941. Roy. Ent. Soc. London, Trans. 91: 403-404.
- hyalinipennis** Ashmead. Mass., Conn., Fla., Calif. Host: *Conophthorus coniperda* (Schw.); *Hypothenemus* spp.; *Pissodes terminalis* Hopping; *Pityophthorus* sp.; *Scolytus rugulosus* (Ratz.). Also recorded from galls of *Amphibolips cinerea* (Ashm.) and *Disholcaspis omnivora* (Ashm.), where, presumably, it parasitizes bark beetles invading the woody tissues of the galls.  
*Cephalonomia hyalinipennis* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 49. ♂, ♀.
- Biology: Stark and Wood, 1964. Canad. Ent. 96: 1217. — Godwin and Odell, 1965. Ent. Soc. Amer., Ann. 58: 218.
- perpusilla** Evans. Oreg., Calif., Ariz.; Mexico (Baja California, Nayarit). Host: Ciid beetle larvae in fungi.  
*Cephalonomia perpusilla* Evans, 1963. Psyche 70: 152. ♂, ♀.
- tarsalis** (Ashmead). Widely distributed in U. S.; probably cosmopolitan. Host: *Oryzaephilus surinamensis* (L.); *Sitophilus oryzae* (L.).  
*Ateleoapterus tarsalis* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 45. ♀, ♂.  
*Cephalonomia carinata* Kieffer, 1907. Berlin. Ent. Ztschr. 51: 295. ♀.  
*Cephalonomia kiefferi* Fouts, 1920. Ent. Soc. Wash., Proc. 22: 77. ♀, ♂.
- Biology: Richards and Herford, 1930. Ann. Appl. Biol. 17: 382. — Powell, 1938. Ent. Soc. Amer., Ann. 31: 44-49.
- utahensis** Brues. Utah, Calif. Host: *Conophthorus lambertianae* Hopk.; *C. monophyllae* Hopk.; *C. ponderosae* Hopk.; *C. radiatae* Hopk.  
*Cephalonomia utahensis* Brues, 1909. Wis. Nat. Hist. Soc., Bul. 6: 154. ♀.
- Biology: Ruckes, 1956. Pan-Pacific Ent. 32: 184-185, 1 fig. — Schaefer, 1962. Ent. Soc. Amer., Ann. 55: 574-575, fig. 6. — Ruckes, 1963. Pan-Pacific Ent. 39: 45.
- waterstoni** Gahan. Widely distributed in North America; probably cosmopolitan. Host: *Laemophloeus ferrugineus* (Steph.).  
*Cephalonomia waterstoni* Gahan, 1931. Wash. Acad. Sci., Jour. 21: 219. ♀.
- Biology: Sheppard, 1936. Colo. Expt. Sta., Tech. Bul. 17: 16-17. — Rilett, 1949. Canad. Jour. Res., Sect. D, Zool. Sci. 27: 1-27. — Finlayson, 1950. Bul. Ent. Res. 41: 79.

# TRIBE SCLERODERMINI

## Genus NESEPYRIS Bridwell

*Nesepyris* Bridwell, 1920. Hawaiian Ent. Soc., Proc. 4: 309.

Type-species: *Nesepyrus ewa* Bridwell. Monotypic.

The small rare species belonging to this genus are probably parasitic on borers in twigs or bark.

**floridanus** Evans. Fla.; Mexico.

*Nesepyrus floridanus* Evans, 1964. Mus. Compar. Zool., Bul. 132: 165, 111, 112, ♀.

**virginianus** Evans. Md., Va. Bred from redbud (*Cercis canadensis*) and found under hickory bark.

*Nesepyrus virginianus* Evans, 1964. Mus. Compar. Zool., Bul. 132: 164, fig. 110. ♀.

#### Genus GLENOSEMA Kieffer

*Glenosema* Kieffer, 1905. Soc. Sci. Bruxelles, Ann. 29: 100. No species.

Type-species: *Glenosema nigra* Kieffer. First included species.

*Arysepyris* Kieffer, 1905. Soc. Sci. Bruxelles, Ann. 29: 102.

Type-species: *Arysepyris merceti* Kieffer. Orig. desig.

**crandalli** Evans. Ariz. (Santa Catalina Mts.).

*Glenosema crandalli* Evans, 1964. Mus. Compar. Zool., Bul. 132: 170, fig. 116. ♀.

#### Genus SCLERODERMUS Latreille

*Sclerodermus* Latreille, 1809. Gen. Crust. Ins., v. 4, p. 118.

Type-species: *Sclerodermus domesticus* Latreille. Monotypic.

*Scleroderma* (!) Oken, 1817. Isis 8: 1178. Emend.

*Schlerochroa* Foerster, 1850. Naturh. Ver. Rheinlande, Verh. 7: 501. Unnecessarily proposed as a new name for *Sclerodermus* Latr.

*Schleroderma* (!) Costa, 1862. Annuario Mus. Zool. Napoli 2: 131. Misspelling.

*Neoscleroderma* Kieffer, 1905. Soc. Sci. Bruxelles, Ann. 29: 106.

Type-species: *Ateleopterus virginianus* Ashmead. Desig. by Kieffer, 1914.

The North American species are parasitic on wood-boring beetle larvae, frequently those infesting houses. The adult wasps have frequently been reported as stinging humans in infested houses.

**carolinensis** (Ashmead). Conn. and N. Y. to Ga. Host: *Dicerca lepida* Lac.; *Urographis fasciata* (de Geer).

*Dissonomphalus carolinensis* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 42, 43. ♀.

*Ateleopterus virginianus* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 45. ♂, ♀.

**macrogaster** (Ashmead). D. C., Va., N. C., Fla., Miss., Tex.; Cuba, Hispaniola, Jamaica, Brazil. Host: *Megacyllene antennatus* (White), *Scolytus rugulosus* (Ratz.), *Xyletinus peltatus* (Harr.).

*Sclerochroa macrogaster* Ashmead, 1887. Ent. Amer. 3: 75. ♀.

#### SUBFAMILY PRISTOCERINAE

##### Genus PRISTOCERA Klug

##### Genus PRISTOCERA Subgenus PRISTOCERA Klug

*Pristocera* Klug, 1808. Mag. Gesell. Naturf. Freunde Berlin 2: 49.

Type-species: *Bethylus depressus* Fabricius. Monotypic.

*Mangesia* Kieffer, 1911. Soc. Sci. Bruxelles, Ann. 35: 209.

Type-species: *Mangesia fuscipennis* Kieffer. Orig. desig.

*Trichelobrachium* Kieffer, 1914. Das Tierreich, Lief. 41, p. 425.

Type-species: *Pristocera oblitterata* Kieffer. Monotypic.

The typical subgenus does not occur in North America.

##### Genus PRISTOCERA Subgenus ACREPYRIS Kieffer

*Acrepyris* Kieffer, 1905. In Andre, Spec. Hym. Eur. Alg., v. 9, p. 249.

Type-species: *Epyris reticulatus* Kieffer. Orig. desig.

*Pristocera* subg. *Neopristocera* Yasumatsu, 1955. Fac. Agr. Kyushu Univ., Jour. 10: 248.

Type-species: *Pristocera japonica* Yasumatsu. Orig. desig.

These wasps are parasitic on the larvae of Elateridae (wireworms) in the soil. Males carry the females in flight during mating.

Revision: Evans, 1963. Mus. Compar. Zool., Bul. 129: 241-290, 60 figs.

*armifera* (Say). N. H. and Vt. south to Fla., west to S. Dak., Colo. and Tex. Host: *Aeolus* sp.;

*Limoniinus agonus* (Say); *Melanotus* sp.

*Bethylus armiferus* Say, 1828. Contrib. Maclur. Lyc. Phila. 1: 80. ♂.

*Scleroderma thoracica* Westwood, 1839. Ent. Soc. London, Trans. 2: 167. ♀.

*Scleroderma contracta* Westwood, 1839. Ent. Soc. London, Trans. 2: 169, pl. 12, fig. 11. ♀.

*Epyris laevis* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 193. ♂.

*Epyris reticulatus* Kieffer, 1904. Arkiv for. Zool. 1: 527. ♂.

Biology: Hyslop, 1916. Ent. Soc. Wash., Proc. 18: 170, pl. 11, figs. 1-3.

Morphology: Snodgrass, 1941. Smithsn. Inst., Misc. Collect. 99, no. 14: 44-46, pl. 15, figs. A-D (male genitalia).

*atra* Klug. N. C. to Fla., west to N. Mex.

*Pristocera atra* Klug, 1810. Beitr. Naturk., v. 2, p. 206. ♂.

Taxonomy: Evans, 1963. Mus. Compar. Zool., Bul. 129: 273-276, figs. 5, 12, 17, 48, 53, 54. ♂, ♀.

*bridwelli* Evans. Ark. (Dodd City).

*Pristocera (Acrepyris) bridwelli* Evans, 1963. Mus. Compar. Zool., Bul. 129: 267. ♂, ♀.

*californica* Evans. Calif., Utah, Wyo.

*Pristocera (Acrepyris) californica* Evans, 1963. Mus. Compar. Zool., Bul. 129: 263. ♂.

*chihuahuana* Evans. Ariz.; Mexico (Chihuahua, Zacatecas).

*Pristocera (Acrepyris) chihuahuana* Evans, 1963. Mus. Compar. Zool., Bul. 129: 284. ♂.

*cockerelli* Evans. Tex. to Calif.; Mexico (Sonora, Oaxaca).

*Pristocera (Acrepyris) cockerelli* Evans, 1963. Mus. Compar. Zool., Bul. 129: 264. ♂, ♀.

*fraterna* Evans. N. C. to Fla., Kans.

*Pristocera (Acrepyris) fraterna* Evans, 1963. Mus. Compar. Zool., Bul. 129: 261. ♂, ♀ (?).

*hyalina* Brues. Ark., La., Tex., N. Mex., south to central Mexico.

*Pristocera hyalina* Brues, 1906. Wis. Nat. Hist. Soc., Bul. 4: 143. ♂.

### Genus APENESIA Westwood

*Apenesia* Westwood, 1874. Thesaurus Ent. Oxon., p. 170.

Type-species: *Apenesia amazonica* Westwood. Desig. by Westwood, 1881.

*Aeluroides* Tullgren, 1904. Ark. Zool. 1: 428.

Type-species: *Aeluroides sjostedti* Tullgren. Monotypic.

*Propristocera* Kieffer, 1905. In Andre, Spec. Hym. Eur. Alg., v. 9, p. 247.

Type-species: *Propristocera interrupta* Kieffer. Desig. by Kieffer, 1914.

*Cleistopyris* Kieffer, 1910. Soc. Ent. France, Ann. 79: 48.

Type-species: *Cleistopyris punctatus* Kieffer. Desig. by Kieffer, 1914.

*Dipristocera* Kieffer, 1914. Das Tierreich, Lief. 41, p. 471.

Type-species: *Dipristocera microchela* Kieffer. Monotypic.

*Neopristocera* Benoit, 1957. Explor. Parc Nat. Albert, Mission DeWitte, fasc. 88, p. 44.

Preoce.

Type-species: *Neopristocera triloba* Benoit. Orig. desig.

Hosts are unknown for the North American species, but two Old World species have been reared from weevil larvae (Curculionidae) in roots or stems.

Revision: Evans, 1963. Mus. Compar. Zool., Bul. 130: 249-359, 138 figs.

### SPECIES GROUP EXILIS

*cochise* Evans. Ariz. (Cochise Co.).

*Apensia cochise* Evans, 1963. Mus. Compar. Zool., Bul. 130: 296, figs. 27, 32. ♂.

*exilis* Evans. Ariz., Calif.

*Apenesia exilis* Evans, 1963. Mus. Compar. Zool., Bul. 130: 293, figs. 28, 30, 33, 34. ♂.

*martini* Evans. Fla. (Manatee Co.).

*Apenesia martini* Evans, 1963. Mus. Compar. Zool., Bul. 130: 294, fig. 29. ♂.

*pima* Evans. Ariz. (Cochise Co.).

*Apenesia pima* Evans, 1963. Mus. Compar. Zool., Bul. 130: 292, figs. 26, 31, 35, 36. ♂.

#### SPECIES GROUP DISSOMPHALOIDES

*dissomphaloides* Evans. Ariz.; Mexico (Sinaloa).

*Apenesia dissomphaloides* Evans, 1963. Mus. Compar. Zool., Bul. 130: 297, figs. 37, 42. ♂.

#### SPECIES GROUP LAEVIGATA

*pallidula* Evans. Ariz. (Cochise Co.).

*Apenesia pallidula* Evans, 1963. Mus. Compar. Zool., Bul. 130: 300, figs. 38, 43, 46, 50. ♂.

#### SPECIES GROUP MEXICANA

*chiricahua* Evans. Tex., Ariz.; Mexico (Sinaloa, Durango, Mexico).

*Apenesia chiricahua* Evans, 1963. Mus. Compar. Zool., Bul. 130: 306, figs. 57, 60, 69, 80, 84. ♂.

*malinche* Evans. Ariz. (Tucson Mts.); Mexico (Sinaloa, Puebla).

*Apenesia malinche* Evans, 1963. Mus. Compar. Zool., Bul. 130: 309, figs. 59, 62. ♂.

*mohave* Evans. Calif.; Mexico (Baja California).

*Apenesia mohave* Evans, 1963. Mus. Compar. Zool., Bul. 130: 308, figs. 58, 61. ♂.

#### SPECIES GROUP BRASILIENSIS

*parapolita* Evans. Ark., La., Ala., and Ga., north to Ill., W. Va. and N. Y.

*Propristocera polita* Evans, 1958. Ent. Soc. Wash., Proc. 59: 294, figs. 2, 6. ♂. Preocc.

*Apenesia parapolita* Evans, 1963. Mus. Compar. Zool., Bul. 130: 322 (male), 347 (female), figs. 81, 96, 127, 136. N. name.

### Genus PARASCLERODERMA Kieffer

*Parascleroderma* Kieffer, 1904. Mus. Civ. Stor. Nat. Genova, Ann. 41: 376.

Type-species: *Parascleroderma fulvipes* Kieffer. Orig. desig.

No host information is available for the single North American species. Two Old World species have been recorded as attacking the larvae of bostrichid and clerid beetles. The normal hosts apparently are larvae occurring under bark or in borings in wood.

*insolita* (Evans). Tex. (Brownsville).

*Apenesia insolita* Evans, 1963. Mus. Compar. Zool., Bul. 130: 350, figs. 130, 138. ♀.

### Genus DISSOMPHALUS Ashmead

*Dissomphalus* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 41.

Type-species: *Dissomphalus xanthopus* Ashmead. Orig. desig.

*Ecitopria* Wasmann, 1899. Zoologica, h. 26, p. 55.

Type-species: *Ecitopria crassicornis* Wasmann. Monotypic.

*Dissemphalus* (!) Ashmead, 1902. Canad. Ent. 34: 271.

? *Psilobethylus* Kieffer, 1906. In Andre, Spec. Hym. Eur. Alg., v. 9, p. 461.

Type-species: *Psilobethylus luteus* Kieffer. Monotypic.

*Thaumatepyris* Kieffer, 1910. Soc. Ent. France, Ann. 79: 47.

Type-species: *Thaumatepyris punctatus* Kieffer. Monotypic.

*Glenobethylus* Kieffer, 1910. Soc. Ent. France, Ann. 79: 50.

Type-species: *Glenobethylus montanus* Kieffer. Monotypic.

*Parecitopria* Ogloblin, 1930. Soc. Ent. Arg., Rev. 3: 15.

Type-species: *Parecitopria azarai* Ogloblin. Monotypic.

Associated data with several species suggest that these minute wasps are probably parasitic on larvae of both myrmecophilous and wood-boring beetles. The wingless females are apparently carried by the males during mating flights.

Revision: Evans, 1954. Ent. Soc. Wash., Proc. 56: 288-309, 21 figs. (North American species).

Taxonomy: Evans, 1962. Ent. Soc. Wash., Proc. 64: 65-78, 4 figs. (revised key, North American and West Indian species).

#### SPECIES GROUP KANSANUS

**arizonicus** Evans. Ariz. (Portal).

*Dissomphalus arizonicus* Evans, 1962. Ent. Soc. Wash., Proc. 64: 70, fig. 3. ♂.

**kansanus** Evans. Pa., Fla., Ill., Kans.

*Dissomphalus kansanus* Evans, 1954. Ent. Soc. Wash., Proc. 56: 302, figs. 4, 11, 17. ♂.

#### SPECIES GROUP XANTHOPUS

**barberi** Evans. Maine, Md., N. C.

*Dissomphalus barberi* Evans, 1954. Ent. Soc. Wash., Proc. 56: 298, figs. 3, 10, 16, 19. ♂, ♀.

**californicus** Ashmead. Ariz., Calif.

*Dissomphalus californicus* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 42. ♂.

Taxonomy: Evans, 1967. Ent. News 78: 17. ♂.

**xanthopus** Ashmead. U. and L. Austr. Zones east of Rockies, south in Mexico to Chiapas.

*Dissomphalus xanthopus* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 42. ♀, ♂.

*Psilobethylus lucidus* Brown and Cheng, 1952. Psyche 58: 146, figs. 2, 3. ♀.

#### SPECIES GROUP APERTUS

**altivolans** Evans. Ill., Ala., La., Tex., Ariz., Calif.; Mexico (Sonora).

*Dissomphalus altivolans* Evans, 1954. Ent. Soc. Wash., Proc. 56: 307, figs. 7, 21. ♂.

Taxonomy: Evans, 1962. Ent. Soc. Wash., Proc. 64: 76. ♀.

**apertus** Kieffer. N. Y., Ohio and Kans., south into Mexico (Cordoba).

*Dissomphalus apertus* Kieffer, 1914. Soc. Ent. France, Bul. 1: 50. ♂.

**foveolatus** (Brown and Cheng). Md., Va., Ga., Ill., Miss., Ark.

*Psilobethylus foveolatus* Brown and Cheng, 1952. Psyche 58: 143, fig. 1. ♀.

**nigrescens** Evans. Tex., ?Ark., La., Ala.

*Dissomphalus nigrescens* Evans, 1954. Ent. Soc. Wash., Proc. 56: 308, figs. 8, 14. ♂.

Taxonomy: Evans, 1962. Ent. Soc. Wash., Proc. 64: 75-76 (putative female).

### Genus PSEUDISOBRACHIUM Kieffer

#### Genus PSEUDISOBRACHIUM Subgenus PSEUDISOBRACHIUM Kieffer

*Pseudisobrachium* Kieffer, 1904. Mus. Civ. Stor. Nat. Genova, Ann. (3a) 1: 368.

Type-species: *Pseudisobrachium laticeps* Kieffer. Desig. by Kieffer, 1906.

*Monepyris* Kieffer, 1905. Soc. Sci. Bruxelles, Ann. 29: 101, 124.

Type-species: *Epyris halidayi* Westwood. Monotypic.

*Xestobethylus* Cameron, 1909. Amer. Ent. Soc., Trans. 35: 449.

Type-species: *Xestobethylus pallidipes* Cameron. Monotypic.

*Plutobethylus* Kieffer, 1910. Soc. Ent. France, Ann. 79: 51.

Type-species: *Plutobethylus distans* Kieffer. Orig. desig.

*Lyssepyris* Kieffer, 1913. Portici Lab. Zool. Gen. e Agr., Bol. 7: 108.

Type-species: *Holepyris flavicornis* Kieffer. Monotypic.

*Xantepyrus* Kieffer, 1913. Portici Lab. Zool. Gen. e Agr., Bol. 7: 108.

Type-species: *Epyris flaviventris* Kieffer. Monotypic.

*Lissepyris* (!) Kieffer, 1914. Das Tierreich, Lief. 41, p. 236. Typ. error.

*Xanthepyrus* Kieffer, 1914. Das Tierreich, Lief. 41, p. 417. Emend.

*Parisobrachium* Kieffer, 1914. Das Tierreich, Lief. 41, p. 424.

Type-species: *Rhabdepyris* (?) *albipes* Kieffer. Monotypic.

Only the typical subgenus occurs in North America.

Females of several species have been found in ant nests, but unsuccessful laboratory testing on ant larvae suggests that the wasps parasitize myrmecophilous beetle larvae occurring in the ant nests.

Revision: Evans, 1961. Mus. Compar. Zool., Bul. 126: 211-318, 5 pls.

## SPECIES GROUP CRASSUM

*crassum* Evans. Tex. (Brownsville, San Antonio).

*Pseudisobranchium crassum* Evans, 1961. Mus. Compar. Zool., Bul. 126: 239, fig. 13. ♂.

*texanum* Evans. Tex. (Harlingen, Brownsville, Wharton, San Antonio).

*Pseudisobranchium texanum* Evans, 1961. Mus. Compar. Zool., Bul. 126: 240, figs. 48, 53. ♂.

## SPECIES GROUP OCCIDENTALE

*castaneum* Evans. Calif. (San Diego).

*Pseudisobranchium castaneum* Evans, 1961. Mus. Compar. Zool., Bul. 126: 248, fig. 56. ♂.

*matthewsi* Evans. Tex., N. Mex., Ariz.

*Pseudisobranchium matthewsi* Evans, 1961. Mus. Compar. Zool., Bul. 126: 249, fig. 36. ♂, ♀ (?).

*occidentale* Evans. Calif., Ariz. Associated with dolichoderine ants.

*Pseudisobranchium occidentale* Evans, 1961. Mus. Compar. Zool., Bul. 126: 244, figs. 14, 55. ♂, ♀ (?).

## SPECIES GROUP OBSCURUM

*carolinianum* Evans. S. C., Fla.

*Pseudisobranchium carolinianum* Evans, 1961. Mus. Compar. Zool., Bul. 126: 254. ♂.

*gibbosum* Evans. N. Mex. (Rodeo).

*Pseudisobranchium gibbosum* Evans, 1961. Mus. Compar. Zool., Bul. 126: 255. ♂.

*obscurum* Evans. Tex., Ariz., Nev., Utah, Calif.; Mexico (Chihuahua, Baja California, Nayarit).

*Pseudisobranchium obscurum* Evans, 1961. Mus. Compar. Zool., Bul. 126: 258, figs. 16, 36. ♂, ♀ (?).

*otiosum* Evans. Ariz.; Mexico (Sonora, Nayarit).

*Pseudisobranchium otiosum* Evans, 1961. Mus. Compar. Zool., Bul. 126: 256. ♂.

*pallidum* Evans. Ariz., Calif.; Mexico (Sonora).

*Pseudisobranchium pallidum* Evans, 1961. Mus. Compar. Zool., Bul. 126: 258, fig. 17. ♂.

*wernerii* Evans. Ariz.; Mexico (Sonora, Sinaloa).

*Pseudisobranchium wernerii* Evans, 1967. Ent. News 78: 20. ♂.

## SPECIES GROUP PROLONGATUM

*arenarium* Evans. N. J., Pa. (?), N. C., Ga., Fla. (?), Ala., Miss., Mo. (?), Ill. Associated with ponerine ants.

*Pseudisobranchium arenarium* Evans, 1961. Mus. Compar. Zool., Bul. 126: 263, figs. 20, 39, 57. ♂, ♀ (?).

*prolongatum* (Provancher). N. B. and N. S. west to B. C., and Wash., south to N. C., Ky., Ill. and Iowa. Associated with formicine and myrmicine ants.

*Bethylus prolongatus* Provancher, 1881. Nat. Canad. 12: 265. "♀" = ♂.

*Isobrachium magnum* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 36. ♂.

*Isobrachium myrmecophilum* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 37. ♀, (♂ misdet.).

*Isobrachium mandibulare* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 38. ♀, (♂ misdet.).

*Isobrachium montanum* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 39. ♀, (♂ misdet.).

*Pseudisobranchium rugosulum* Fouts, 1928. Ent. Soc. Wash., Proc. 30: 124. ♂.

*Pseudisobranchium agilis* Whittaker, 1928. Roy. Ent. Soc. London, Trans. 76: 386, pl. 13, fig. 4. ♂.

## SPECIES GROUP CARBONARIUM

*ashmeadi* Evans. Mass., Ont., Mich. and Kans., south to Fla., Ala. and La. Host: Associated with formicine and dolichoderine ants.

*Pseudisobranchium ashmeadi* Evans, 1961. Mus. Compar. Zool., Bul. 126: 275, figs. 23, 33, 52, 63. ♂, ♀ (?).

*carbonarium* (Ashmead). Md. south to Ga., Ala., W. Va., Ky. (?), Ill., Kans., N. Dak. (?).

*Epyris carbonarius* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 59, pl. 4, fig. 4. ♂.

Taxonomy: Evans, 1961. Mus. Compar. Zool., Bul. 126: 271, figs. 23, 37. ♂, ♀ (?).

**krombeini** Evans. Tex., N. Mex.; Mexico (Sonora).

*Pseudisobrachium krombeini* Evans, 1961. Mus. Compar. Zool., Bul. 126: 287, figs. 27, 50. ♂.

**minimum** Evans. N. Mex., Ariz.; Mexico (Sinaloa, Michoacan, Mexico).

*Pseudisobrachium minimum* Evans, 1961. Mus. Compar. Zool., Bul. 126: 280, fig. 24. ♂.

**minutissimum** Evans. N. Mex., Ariz.; Mexico (Morelos, Baja California), Guatemala.

*Pseudisobrachium minutissimum* Evans, 1961. Mus. Compar. Zool., Bul. 126, fig. 26. ♂.

**navajo** Evans. Ariz. (Coconino and Yavapai Counties).

*Pseudisobrachium navajo* Evans, 1961. Mus. Compar. Zool., Bul. 126: 283, fig. 25. ♂.

**persimile** Evans. Calif., B. C. (?).

*Pseudisobrachium persimile* Evans, 1961. Mus. Compar. Zool., Bul. 126: 284, fig. 2. ♂, ♀ (?).

#### SPECIES GROUP RUFIVENTRE

**apache** Evans. Ariz. (Santa Cruz, Gila and Pinal Counties).

*Pseudisobrachium apache* Evans, 1961. Mus. Compar. Zool., Bul. 126: 299, fig. 46. ♂.

**comanche** Evans. Ariz., Tex.; Mexico (Sinaloa).

*Pseudisobrachium comanche* Evans, 1961. Mus. Compar. Zool., Bul. 126: 298, fig. 59. ♂.

**emarginatum** Evans. Tex. (Kerrville).

*Pseudisobrachium emarginatum* Evans, 1961. Mus. Compar. Zool., Bul. 126: 303, fig. 49. ♂.

**flavinervis** Fouts. Tex., Ariz., Nev., Calif.; Mexico (Sonora, Nayarit).

*Pseudisobrachium flavinervis* Fouts, 1928. Ent. Soc. Wash., Proc. 30: 123. ♂.

Taxonomy: Evans, 1961. Mus. Compar. Zool., Bul. 126: 305, figs. 6, 31, 38, 62. ♂, ♀ (?).

**flaviventre** (Kieffer). Del. to Fla., west to Tex., Kans., Ill. Host: Associated with myrmicine ants.

*Epyris flaviventris* Kieffer, 1904. Arkiv for Zool. 1: 526. ♂.

Taxonomy: Evans, 1961. Mus. Compar. Zool., Bul. 126: 288, figs. 41, 60. ♂, ♀ (?).

**foutsii** Evans. Tex., N. Mex. (?), Ariz. (?), Calif. (?); Mexico (Sonora, Coahuila).

*Pseudisobrachium foutsii* Evans, 1961. Mus. Compar. Zool., Bul. 126: 300, figs. 29, 61. ♂.

**macrops** Evans. Tex. (Cameron and Hidalgo Counties).

*Pseudisobrachium macrops* Evans, 1961. Mus. Compar. Zool., Bul. 126: 309. ♂.

**pusillum** Evans. La. (Shreveport), Ark. (?).

*Pseudisobrachium pusillum* Evans, 1961. Mus. Compar. Zool., Bul. 126: 297. ♂, ♀ (?).

**rectangulatum** Evans. Tex., Kans., Nebr.; Mexico (Nuevo Leon).

*Pseudisobrachium rectangulatum* Evans, 1961. Mus. Compar. Zool., Bul. 126: 304. ♂.

**rufiventre** (Ashmead). Mass. and N. Y. south to Fla. and La. Host: Associated with formicine ants.

*Isobrachium rufiventre* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 38. ♀, ♂.

*Pseudisobrachium flavicoris* Fouts, 1928. Ent. Soc. Wash., Proc. 30: 122. ♀.

*Pseudisobrachium puncticeps* Fouts, 1928. Ent. Soc. Wash., Proc. 30: 123. ♂.

#### UNPLACED TAXA OF PSEUDISOBRACHIUM SUBGENUS PSEUDISOBRACHIUM KIEFFER

**anomalum** Evans. N. J., Va., Fla., Ill.

*Pseudisobrachium anomalum* Evans, 1961. Mus. Compar. Zool., Bul. 126: 311, figs. 8, 54, 64, 67. ♂.

**paucipunctata** Fouts. Utah, Calif.

*Pseudisobrachium paucipunctata* Fouts, 1928. Ent. Soc. Wash., Proc. 30: 122. ♀.

#### UNPLACED TAXA OF BETHYLIDAE

*Bethylus musculus* Say, 1836. Boston Jour. Nat. Hist. 1: 280. Ind.

### Family SCLEROGIBBIDAE

So far as is known, members of this family are parasites of Embioptera. The wasp larvae develop as external parasites of embiid nymphs in much the same manner as larval Dryinidae and Rhopalosomatidae.

Revision: Richards, 1939. Roy. Ent. Soc. London, Proc., Ser. B, Taxonomy, 8: 211-223.

Morphology: Reid, 1941. Roy. Ent. Soc. London, Trans. 91: 412-414, figs. 53-54 (female, male thorax).

### Genus PROBETHYLUS Ashmead

*Probethylus* Ashmead, 1902. Canad. Ent. 34: 270.

Type-species: *Probethylus schwarzi* Ashmead. Orig. desig.

Taxonomy: Shetlar, 1973. Ent. News 84: 205-206 (generic redescription, key to spp.).

Biology: Callan, 1939. Roy. Ent. Soc. London, Proc., Ser. B, Taxonomy, 8: 223-224 (*Probethylus callani* Rich. from Trinidad).

*schwarzi* Ashmead. Ariz.

*Probethylus schwarzi* Ashmead, 1902. Canad. Ent. 34: 270. ♂.

Taxonomy: Shetlar, 1973. Ent. News 84: 206-208, figs. 1-4 (redescription male, female).

Biology: Shetlar, 1973. Ent. News 84: 208, fig. 5 (host, life history).

## Family CHRYSIDIDAE

The cuckoo or ruby-tailed wasps constitute one of the most attractive families of Hymenoptera because of their brilliantly metallic coloration. Almost all of our species are either purple, blue or green, but many Palaearctic species are marked also with golden or ruby in specific patterns.

The behavior and life history also make this a very fascinating group. All species are parasitic, and, as one common name implies, many of them exhibit behavior in the host nests similar to that of cuckoos in the nests of their bird hosts. Members of the small subfamilies Cleptinae and Amiseginae parasitize, respectively, the resting larvae of sawflies in their cocoons and eggs of walking sticks. Almost all species belonging to the Elampinae, Chrysidinae and Parnopinae have as their hosts solitary wasps or bees which nest in the ground or in cavities in wood or which build mud cells; one exotic species of *Chrysis* L. is known to parasitize the resting larva of the oriental moth in its cocoon. The parasite egg is deposited in the host cell while it is being provisioned by the mother wasp or bee. In most species the newly hatched chrysidid larva devours the host egg or young larva and then feeds on the provisions stored for the host. However, in species of *Chrysura* Dahlb. the parasite larva attaches to the host larva, sucks only a small amount of body fluids, and does not devour the host larva until the latter attains full growth and spins its cocoon. Eggs of *Parnopes* Latr. and *Chrysis pellucidula* Aar. are deposited in the host nest while the host wasp is provisioning; these parasite larvae also devour the resting host larva in its cocoon. The female of *Chrysis fuscipennis* Br. chews a hole in the host mud cell, oviposits therein, and the parasite larva develops on the resting larva of the host.

The arrangement of genera in the Chrysidinae and division into Species Groups in *Chrysis* Linnaeus are by R. M. Bohart who also contributed new synonymy and distribution in both the Chrysidinae and Elampinae.

### SUBFAMILY CLEPTINAE

So far as is known, members of this subfamily are parasitic on resting larvae of sawflies in their cocoons.

Revision: Aaron, 1885. Amer. Ent. Soc., Trans. 12: 209-248 (No. Amer. spp.). —Mocsary, 1889.

Monog. Chrysid., 643 pp. (spp. of world). —Ashmead, 1902. Canad. Ent. 34: 221-231 (gen.).

—Bischoff, 1913. Gen. Ins., Fasc. 151, 86 pp., 5 pls. —Linsenmaier, 1959. Schweiz. Ent. Ges., Mitt. 32: 1-232, 711 figs. (European spp.).

Biology: Krombein, 1958. Amer. Ent. Soc., Trans. 84: 141-168, 2 pls. (spp. of coastal N. C.).

—Krombein, 1967. Trap-nesting wasps and bees, pp. 437-475, figs. 87, 88, 128-134 (life history of spp. attacking wasps and bees nesting in borings in wood.).



Genus **CLEPTES** LatreilleGenus **CLEPTES** Subgenus **CLEPTES** Latreille

*Cleptes* Latreille, 1802. Hist. Nat. Crust. Ins. 3: 316.

Type-species: *Sphex semiauratus* Linnaeus. Monotypic.

**semiauratus** (Linnaeus). New Jersey (Metuchen); Europe. Adventive from Europe. Host: *Pristiphora* sp., *Nematus* spp., *Pachynematus* spp. in Europe.  
*Sphex semiauratus* Linnaeus, 1761. Fauna Suec., Ed. 2, p. 413. ♂.

Biology: Gauss, 1964. Ztschr. f. Angew. Ent. 54: 225-232, figs. 1-4 (life history, European hosts).

Genus **CLEPTES** Subgenus **LEIOCLEPTES** Moczar

*Cleptes* subg. *Leiocleptes* Moczar, 1962. Acta. Zool., Acad. Sci. Hungaricae 8: 118.

Type-species: *Cleptes nitidulus* Fabr. Orig. desig.

**alienus** Patton. Mont., Wyo.

*Cleptes aliena* Patton, 1879. Canad. Ent. 11: 66. ♀.

**blaisdelli** Bridwell. Calif.

*Cleptes blaisdelli* Bridwell, 1919. Hawaii. Ent. Soc., Proc. 4: 37. ♂.

**insperatus** Aaron. Mont.

*Cleptes insperata* Aaron, 1885. Amer. Ent. Soc., Trans. 12: 212. ♀.

Genus **CLEPTES** Subgenus **MELANOCLEPTES** Moczar

*Cleptes* subg. *Melanocleptes* Moczar, 1962. Acta Zool., Acad. Sci. Hungaricae 8: 121.

Type-species: *Cleptes morawitzi* Rad. Orig. desig.

**provancheri** Aaron. Canada, "Wash. Ter.", Idaho, Colo. Host: *Neodiprion* sp. near *scutellatus* Rohw.

*Cleptes americana* Provancher, 1881. Nat. Canad. 12: 304. ♀. Preocc.

*Cleptes provancheri* Aaron, 1885. Amer. Ent. Soc., Trans. 12: 212. N. name.

Biology: Smith, 1962. Pan-Pacific Ent. 38: 189.

**purpuratus** Cresson. Wash., Oreg., Calif., Colo., Nev. Host: *Neodiprion* sp. in *fulviceps* complex, N. sp.

*Cleptes purpurata* Cresson, 1879. Amer. Ent. Soc., Trans. 7: Proc., p. x. ♀.

*Cleptes Americana* Cresson, 1879. Amer. Ent. Soc., Trans. 7: Proc., p. x. ♂, ♀.

Biology: Dahlsten, 1961. Canad. Ent. 93: 192-193. — Dahlsten, 1967. Ecology 48: 287.

**speciosus** Aaron. Mont.

*Cleptes speciosa* Aaron, 1885. Amer. Ent. Soc., Trans. 12: 212. ♀.

## SUBFAMILY AMISEGINAE

Members of this subfamily are parasitic in the eggs of walking sticks.

Taxonomy: Krombein, 1957. Amer. Ent. Soc., Trans. 82: 147-215, 4 pls. (generic reclassification of world fauna).

Genus **MESITIOPTERUS** Ashmead

*Mesitiopterus* Ashmead, 1902. Canad. Ent. 34: 231.

Type-species: *Mesitiopterus KahlII* Ashmead. Orig. desig.

**floridensis** Krombein. Fla. (Gainesville).

*Mesitiopterus floridensis* Krombein, 1960. Amer. Ent. Soc., Trans. 86: 28, fig. 6. ♂, ♀.

**kahlII** Ashmead. N. Y. south to N. C., Wis., Minn., Kans., Ariz. Host: *Diapheromera femorata* Say, eggs.

*Mesitiopterus KahlII* Ashmead, 1902. Canad. Ent. 34: 231. ♂.

Biology: Milliron, 1950. Ent. Soc. Wash., Proc. 52: 47.

## Genus MICROSEGA Krombein

*Microsega* Krombein, 1960. Amer. Ent. Soc., Trans. 86: 31.

Type-species: *Microsega bella* Krombein. Orig. desig.

*bella* Krombein. Tex., Okla.

*Microsega bella* Krombein, 1960. Amer. Ent. Soc., Trans. 86: 32, figs. 1, 2, 5. ♀.

## Genus ADELPHÉ Mocsary

*Adelphé* Mocsary, 1890. Termes. Fuzetek 13: 46.

Type-species: *Adelphé mexicana* Mocsary. Monotypic.

*Pseudepyris* Ducke, 1902. Ztschr. Hym. Dipt. 2: 204.

Type-species: *Pseudepyris paradoxa* Ducke. Monotypic.

*Adelpha* Schulz, 1906. Spolia Hym., p. 153. Proposed unnecessarily for *Adelphé* Mocsary. Preocc.

*Parachrysis* Kieffer, 1910. Soc. Ent. France, Ann. 78: 287. Preocc.

Type-species: *Parachrysis metallica* Kieffer. Monotypic.

*anisomorphae* Krombein. Ga., Fla., La. Host: *Anisomorpha ferruginea* (Beauv.), eggs.

*Adelphé anisomorphae* Krombein, 1960. Amer. Ent. Soc., Trans. 86: 35, fig. 3. ♂, ♀.

## SUBFAMILY ELAMPINAE

These predominantly small wasps are parasites of solitary ground- and wood-nesting wasps and bees.

## Genus OMALUS Panzer

Most of these species parasitize twig-nesting wasps although one has been reared from a ground-nesting species. Authenticated host records all pertain to aphid-storing pemphredonine wasps. European records of other wasps and bees as hosts of *Omalus* are probably erroneous and based on mixed nests where supersedure by or of the pemphredonine had occurred.

Revision: Bohart and Campos, 1960. Ent. Soc. Amer., Ann. 53: 235-250, 30 figs.

## Genus OMALUS Subgenus OMALUS Panzer

*Omalus* Panzer, 1801. Faunae Ins. German. H. 85, no. 13.

Type-species: *Chrysis aenea* Fabricius. Monotypic.

*Homalus* Saunders, 1873. Ent. Soc. London, Trans. p. 411. Emend.

*Ellampus* subg. *Dictenulus* Semenov, 1932. Soc. Ent. Ross., Hor. 42: 6.

Type-species: *Ellampus (Dictenulus) specularis* Semenov. Orig. desig.

*aeneus* (Fabricius). Canada and U. S. south to Ga., N. Mex. and Ariz., chiefly in Canadian and Transition Zones, occasionally Upper Austral; Europe. Host: *Passaloecus cuspidatus* Sm.; *P. sp.*; *Pemphredon* sp. Predator: *Philanthus pulcher* D. T.

*Chrysis aeneus* Fabricius, 1787. Mant. Ins. 1: 284.

*Omalus laeiventris* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 303. ♀.

*Elampus cyanescens* Provancher, 1881. Nat. Canad. 12: 303. ♀.

*Omalus diversus* Aaron, 1885. Amer. Ent. Soc., Trans. 12: 213. ♀.

Biology: Parker and Bohart, 1966. Pan-Pacific Ent. 42: 97 (host record). —Krombein, 1967.

Trap-nesting wasps and bees, p. 442 (life history). —Evans, 1973. Great Basin Nat. 33: 155 (host).

*butleri* Bohart and Campos. Ariz., N. Mex., Utah, Colo., B. C., Ind., N. Y.

*Omalus (Omalus) butleri* Bohart and Campos, 1960. Ent. Soc. Amer., Ann. 53: 240, figs. 6, 17. ♀, ♂.

*glomeratus* (du Buysson). Calif. to Wash., east to Idaho, Colo., N. Mex. Host: *Stigmus i. inordinatus* Fox.

*Ellampus glomeratus* du Buysson, 1901. K. K. Naturhist. Hofmus., Ann. 16: 98. ♂.

Biology: Parker and Bohart, 1966. Pan-Pacific Ent. 42: 95 (host record).

*iridescens* (Norton). Throughout Canada and U. S., in Canadian, Transition and Austral Zones.

Host: *Stigmus i. inordinatus* Fox, *S. americanus* Pack., *Psenulus trisulcus* (Fox), *Passaloecus* sp.

*Elampus iridescens* Norton, 1879. Amer. Ent. Soc., Trans. 7: 234. ♂.

*Elampus marginatus* Provancher, 1881. Nat. Canad. 12: 304. ♀. Preocc.

Biology: Davidson, 1895. Psyche 7: 271 (host record). — Krombein, 1958. U. S. Dept. Agr., Monog. 2, Sup. 1: 94. — Krombein, 1967. Trap-nesting wasps and bees, pp. 442-443 (life history).

#### Genus OMALUS Subgenus PSEUDOMALUS Ashmead

*Pseudomalus* Ashmead, 1902. Canad. Ent. 34: 229.

Type-species: *Omalus semicircularis* Aaron. Monotypic.

*auratus* (Linnaeus). N. Y. south to S. C., Ohio, Ind.; widely distributed in the Palearctic Region. Undoubtedly adventive in U. S. Host: *Pemphredon l. lethifer* (Shuck.),

*Passaloecus turionum* Dahlb.; *Perithous divinator* (Rossi).

*Sphex aurata* Linnaeus, 1758. Syst. Nat., ed. 10, p. 572.

*Hedychrum sinuosum* Say, 1828. Contrib. Maclur. Lyc. Phila. 1: 82. ♀.

Taxonomy: Krombein, 1959. Brooklyn Ent. Soc., Bul. 54: 95-96.

Biology: Thomas, 1962. Ent. News 73: 217-218.

*janus* (Haldeman). Canada and U. S. south to Calif., Ariz., N. C., chiefly in Canadian and Transition Zones. Host: *Pemphredon concolor* Say, *P. errans* Roh.

*Hedychrum janus* Haldeman, 1844. Acad. Nat. Sci. Phila., Proc. 1: 53. ♀.

*Elampus coruscans* Norton, 1879. Amer. Ent. Soc., Trans. 7: 234. ♀.

*Omalus coruscans* (!) Aaron, 1885. Amer. Ent. Soc., Trans. 12: 214.

Biology: Parker and Bohart, 1966. Pan-Pacific Ent. 42: 94 (host record).

*purpuratus* (Provancher). Alaska, Canada and U. S. south to Calif., Ariz. and Ga. Host:

*Stigmus americanus* Pack., *Pemphredon l. lethifer* (Shuck.), *P. harbecki* Roh. ?,

*Passaloecus cuspidatus* Sm.

*Elampus purpuratus* Provancher, 1881. Nat. Canad. 12: 302. ♀.

*Elampus purpurascens* (!) Provancher, 1881. Nat. Canad. 12: 303.

*Omalus* (*Pseudomalus*) *macswaini* Bohart and Campos, 1960. Ent. Soc. Amer., Ann. 53: 244, fig. 22. ♂, ♀. N. syn. (W. R. M. Mason).

Biology: Krombein, 1960. Ent. News 71: 32-33 (host record). — Parker and Bohart, 1966.

Pan-Pacific Ent. 42: 94 (host record). — Evans, 1973. Great Basin Nat. 33: 155 (host).

*semicircularis* Aaron. Colo., Nev.

*Omalus semicircularis* Aaron, 1885. Amer. Ent. Soc., Trans. 12: 215. ♂.

*trilobatus* Bohart and Campos. B. C. and Idaho south to Calif., Ariz. and Colo., in Canadian, Transition and Upper Sonoran Zones. Host: *Pemphredon giffardi* (Roh.).

*Omalus* (*Pseudomalus*) *trilobatus* Bohart and Campos, 1960. Ent. Soc. Amer., Ann. 53: 245, figs. 4, 15, 25, 28. ♂, ♀.

Biology: Parker and Bohart, 1966. Pan-Pacific Ent. 42: 94 (host record).

#### Genus OMALUS Subgenus DIPLORRHOS Aaron

*Diplorrhous* Aaron, 1885. Amer. Ent. Soc., Trans. 12: 216.

Type-species: *Diplorrhous plicatus* Aaron. Monotypic.

*cressoni* (Aaron). Oreg., Calif., Ariz., Colo., Utah, Mont., Nebr. Host: *Diodontus occidentalis* Fox, *Pemphredon giffardi* (Roh.), *Stigmus i. inordinatus* Fox, *Passaloecus cuspidatus* Sm.

*Elampus cressoni* Aaron, 1885. Amer. Ent. Soc., Trans. 12: 215. ♂, ♀.

Biology: Powell, 1964. Wasmann Jour. Biol. 21: 172-173 (host record). — Parker and Bohart, 1966. Pan-Pacific Ent. 42: 94-95 (host record). — Evans, 1973. Great Basin Nat. 33: 155 (host).

**downeyi** Bohart and Campos. Oreg., Calif., Nev., chiefly in Canadian Zone.

*Omalus (Diplorhros) downeyi* Bohart and Campos, 1960. Ent. Soc. Amer., Ann. 53: 246, figs. 5, 8. ♂, ♀.

**granti** Bohart and Campos. Calif., Ariz., N. Mex., Nev., Colo.

*Omalus (Diplorhros) granti* Bohart and Campos, 1960. Ent. Soc. Amer., Ann. 53: 247, fig. 19. ♂, ♀.

**intermedius** (Aaron). Mont., Md. Host: *Diodontus virginianus* (Roh.).

*Notozus intermedius* Aaron, 1885. Amer. Ent. Soc., Trans. 12: 218. ♂.

Biology: Krombein, 1963. Ent. Soc. Wash., Proc. 65: 264 (host record).

**krombeini** Bohart and Campos. Ariz., southern Calif.

*Omalus (Diplorhros) krombeini* Bohart and Campos, 1960. Ent. Soc. Amer., Ann. 53: 247, figs. 3, 13. ♂, ♀.

**plicatus** (Aaron). Alaska, Canada, western and northern U. S. south to Calif., N. Mex., Minn., Mich., N. Y.

*Diplorhros plicatus* Aaron, 1885. Amer. Ent. Soc., Trans. 12: 216. ♂, ♀.

**seminudus** (Aaron). Alaska, B. C. south to Calif., Idaho, Ont.

*Notozus seminudus* Aaron, 1885. Amer. Ent. Soc., Trans. 12: 218. ♂, ♀.

**speculum** (Say). Wash., Oreg., Calif., Colo.

*Hedychrum speculum* Say, 1836. Boston Jour. Nat. Hist. 1: 225. ♂.

**telfordi** Bohart and Campos. Tex. to southern Calif., Nev.

*Omalus (Diplorhros) telfordi* Bohart and Campos, 1960. Ent. Soc. Amer., Ann. 53: 249, figs. 14, 27. ♂, ♀.

**variatus** (Aaron). Western N. Amer. in Canadian, Transition and Upper Sonoran Zones. Host: *Stigmus i. inordinatus* Fox.

*Elampus variatus* Aaron, 1885. Amer. Ent. Soc., Trans. 12: 215. ♂, ♀.

Biology: Parker and Bohart, 1966. Pan-Pacific Ent. 42: 95 (host record).

#### Genus NOTOZUS Foerster

*Elampus* Spinola, 1806. Insectorum Liguriae, v. 1, p. 10.

Type-species: *Chrysis panzeri* Fabricius. Desig. by Latreille, 1810.

*Notozus* Foerster, 1853. Naturh. Ver. Rheinlande, Verh. 10: 351.

Type-species: *Notozus frivaldszkii* Foerster. Desig. by Bodenstein, 1939 (= *Chrysis panzeri* Fabricius).

*Ellampus* (!) Agassiz, 1846. Nomencl. Zool., Index Univ., pp. 135, 136.

The few available host records indicate that species of this genus parasitize ground-nesting sphecoid wasps.

Taxonomy: Huber, 1975. Bul. Zool. Nomencl. 32: 181-187 (petition to suppress *Elampus* Spinola, 1806, and place *Notozus* Foerster, 1853, on Official List of Generic Names).

**aaroni** (Bodenstein), n. comb. Man., Sask., Alta., Mont., Colo., Calif.

*Notozus productus* Aaron, 1885. Amer. Ent. Soc., Trans. 12: 219. ♀. Preocc.

*Elampus aaroni* Bodenstein, 1951. U. S. Dept. Agr., Monog. 2: 719. N. name.

**connexus** Viereck. Kans., Calif.

*Notozus connexus* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 192.

**hyalinus** Aaron. N. C., Fla., Mich., Ill., Minn., Iowa, Mo., S. Dak., Kans., Tex., Okla., Colo., N. Mex., Mont., Nev., Utah, Ariz.

*Notozus hyalinus* Aaron, 1885. Amer. Ent. Soc., Trans. 12: 218. ♀.

**marginatus** Patton. Entire U. S. and Canada.

*Notozus marginatus* Patton, 1879. Canad. Ent. 11: 66.

**nitidus** Aaron. West and Southwest, east to Iowa, Man.; Mexico (Sonora).

*Notozus nitidus* Aaron, 1885. Amer. Ent. Soc., Trans. 12: 218. ♂.

**versicolor** (Norton), n. comb. Calif., Mont., Ariz., N. Mex., "Dakota," Kans., Man.; Mexico (Baja California).

*Elampus versicolor* Norton, 1879. Amer. Ent. Soc., Trans. 7: 235. ♂.

**viridicyaneus** (Norton), n. comb. Transcont. in Canad., Transit. and Austral Zones. Host:

*Hoplisoides costalis* (Cress.). Predator: *Philanthus pulcher* D. T.

*Elampus viridicyaneus* Norton, 1879. Amer. Ent. Soc., Trans. 7: 235. ♀.

*Elampus spinosus* Provancher, 1881. Nat. Canad. 12: 302. ♀.

### Genus HOLOPYGA Dahlbom

*Holopyga* Dahlbom, 1845. Dispos. Method. Spec. Hym., pt. 2, p. 4.

Type-species: *Holopyga amoena* Dahlbom. Desig. by Ashmead, 1902 (= *Chrysis gloriosa* Fabricius).

*Holopyga* (!) Tournier, 1878. Schweiz. Ent. Gesell., Mitt. 5: 305.

Members of this genus are parasites of ground-nesting sphecids wasps.

**hora** Aaron. Calif., Idaho, Nev., N. Mex., Colo., Wyo., Ariz., Mont., Kans., Tex.; Mexico (Baja California, Oaxaca).

*Holopyga horus* Aaron, 1885. Amer. Ent. Soc., Trans. 12: 220. ♂, ♀.

*Hedychrum continuum* Aaron, 1885. Amer. Ent. Soc., Trans. 12: 224. ♂, ♀. N. syn. (R. M. Bohart).

**lazulina** Dahlbom. Ill., Tex. south to Argentina.

*Holopyga lazulina* Dahlbom, 1854. Hym. Europaea, v. 2, p. 49.

**ventralis** (Say). Widely distributed throughout U. S., Canada and north. Mexico. Host: *Bicyrtes fodiens* (Handl.), *B. quadrifasciata* (Say). Predator: *Philanthus pulcher* D. T.

*Hedychrum ventrale* Say, 1824. In Keating, Narr. Long's 2nd. Exped., v. 2, App., p. 330.

*Hedychrum asperum* Brulle, 1846. Hist. Nat. Ins. Hym., v. 4, p. 52. ♀. N. syn. (R. M. Bohart).

*Holopyga Dohrni* Dahlbom, 1854. Hym. Europaea, v. 2, p. 48.

*Holopyga compacta* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 304.

Biology: Evans, 1966. Compar. ethology and evolution of sand wasps, pp. 160, 169 (hosts).

Morphology: Snodgrass, 1941. Smithsn. Inst., Misc. Collect. 99, no. 14, pp. 42-43, pl. 13 (male genitalia).

### Genus MUESEBECKIDIUM Krombein

*Muesebeckidium* Krombein, 1969. Ent. Soc. Wash., Proc. 71: 352.

Type-species: *Hedychrum obsoletum* Say. Orig. desig.

**obsoletum** (Say). Widely distributed in North America in U. and L. Austr. Zones east of 100th meridian.

*Hedychrum obsoleta* Say, 1836. Boston Jour. Nat. Hist. 1: 284. ? ♀.

*Hedychrum zimmermanni* Dahlbom, 1845. Dispos. Method. Spec. Hym., pt. 2, p. 2. ♂.

**occidentale** Krombein. N. Mex., Ariz.; Mexico (Sonora, Durango).

*Muesebeckidium occidentale* Krombein, 1969. Ent. Soc. Wash., Proc. 71: 357, fig. 13. ♂, ♀.

### Genus PSEUDOLOPYGA Krombein

*Pseudolopyga* Krombein, 1969. Ent. Soc. Wash., Proc. 71: 357.

Type-species: *Holopyga taylori* Bodenstein. Orig. desig.

**taylori** (Bodenstein). Mo., N. Mex., Ariz., Nev., Idaho, Calif. Host: *Solierella affinis blaisdelli* (Bridw.); *S. peckhami* (Ashm.).

*Holopyga taylori* Bodenstein, 1939. Ent. News 50: 19. ♂, ♀.

*Hedychridium carrilloi* Bohart and Brumley, 1967. Pan-Pacific Ent. 43: 232, figs. 1-4. ♂, ♀.

Taxonomy: Carrillo and Caltagirone, 1970. Ent. Soc. Amer., Ann. 63: 677-679, figs. 8-11 (egg, larvae, pupa, cocoon).

Biology: Krombein, 1967. Trap-nesting wasps and bees, p. 443 (host). —Carrillo and Caltagirone, 1970. Ent. Soc. Amer., Ann. 63: 677-679, figs. 8-12 (life history).

## Genus HEDYCHRIDIDUM Abeille de Perrin

*Hedychridium* Abeille de Perrin, 1878. Diagn. Chrysid. Nouv., p. 3.

Type-species: *Hedychrum minutum* Lepeletier. Desig. by Ashmead, 1902 (= *Chrysis ardens* Coquebert).

Most species of *Hedychridium* parasitize ground-nesting wasps and bees, but one has been recorded as parasitizing a twig-nesting sphecid wasp.

**amabile** Cockerell. Calif., Ariz., Nev., Utah, N. Mex.; Mexico (Baja California, Sonora).

*Hedychridium amabile* Cockerell, 1903. Canad. Ent. 35: 262.

**caeruleum** (Norton). N. J., Ind., Ill., Iowa, N. Dak., Mont.

*Hedychrum caeruleum* Norton, 1879. Amer. Ent. Soc., Trans. 7: 239. ♀.

**cockerelli** du Buysson. Colo., S. Dak.

*Hedychridium cockerelli* du Buysson, 1906. Rev. Ent. Caen 25: 111. ♂.

**dimidiatum** (Say). Throughout U. S. and Canada; Mexico.

*Hedychrum dimidiatum* Say, 1824. In Keating, Narr. Long's 2nd Exped., v. 2, App., p. 330, n. 2.

*Chrysis Mexicana* Cameron, 1888. Biol. Cent.-Amer., Hym., v. 1, p. 460. N. syn. (R. M. Bohart).

*Holopyga* (*Hedychridium*) *mexicana* Mocsary, 1911. Mus. Nat. Hungarici, Ann. 9: 448. ♂. N. syn. (R. M. Bohart).

**fletcheri** Bodenstein. Western U. S. and Canada to Ind. and Sask., Ala., Fla. Host: *Tachysphex similis* Roh. Predator: *Philanthus pulcher* D. T.

*Hedychrum viride* Cresson, 1865. Ent. Soc. Phil., Proc. 4: 306. Preocc.

*Hedychridium fletcheri* Bodenstein, 1951. U. S. Dept. Agr. Monog., 2: 720. N. name.

Biology: Kurczewski, 1967. Kans. Ent. Soc., Jour. 40: 278-284, 1 fig. (life history, behavior).

**semirufum** (Cockerell). N. Mex., Ariz.

*Holopyga semirufa* Cockerell, 1896. Psyche (sup.) 7: 17. ♀.

**solierellae** Bohart and Brumley. Western U. S., B. C.; Mexico (Baja California). Host:

*Solierella affinis blaisdelli* (Bridw.); *S. peckhami* (Ashm.).

*Hedychridium solierellae* Bohart and Brumley, 1967. Pan-Pacific Ent. 43: 234. ♂, ♀.

Taxonomy: Carrillo and Caltagirone, 1970. Ent. Soc. Amer., Ann. 63: 679-680, figs. 13-15 (egg, larvae, pupa, cocoon).

Biology: Carrillo and Caltagirone, 1970. Ent. Soc. Amer., Ann. 63: 679-680, figs. 13-15 (life history).

## Genus HEDYCHRUM Latreille

*Hedychrum* Latreille, 1802. Hist. Nat. Crust. Ins., v. 3, p. 317.

Type-species: *Hedychrum lucidulum* Latreille. Monotypic (= *Sphex nobile* Scopoli).

*Hedycrum* (!) Say, 1825. In Keating, Narr. Long's 2nd Exped., v. 2, App., p. 65.

Wasps of this genus are parasitic on ground-nesting wasps and bees.

**confusum** du Buysson. U. S. and Canada west to N. Mex., Wyo., Sask. Host: *Cerceris halone* Bks., *C. architis* Mick.

*Hedychrum confusum* du Buysson, 1891. Rev. Ent. Caen 10: 30. ♂, ♀.

*Hedychrum nearcticum* Mocsary, 1914. Mus. Nat. Hungarici, Ann. 12: 11. ♀. N. syn. (R. M. Bohart).

**cupricolle** Cresson. Alta., Colo., Kans., Nebr., Minn.

*Hedychrum cupricolle* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 305. ♀.

**louisianiae** Norton. N. C., Fla. west to N. Mex., Mo., Kans., Colo.; Mexico (Mexico).

*Hedychrum Louisianiae* Norton, 1879. Amer. Ent. Soc., Trans. 7: 238. ♂.

*Hedychrum Louisianae* (!) Aaron, 1885. Amer. Ent. Soc., Trans. 12: 223. Emend.

**nigropilosum** Mocsary. Western U. S. and Canada to Wyo., Colo., Alta.

*Hedychrum nigropilosum* Mocsary, 1889. Monog. Chrysid., p. 162. ♂.

**parvum** Aaron. Transcontinental in U. S., Man., Alta., B. C., N. W. T.

*Hedychrum violaceum* var. *parvum* Aaron, 1885. Amer. Ent. Soc., Trans. 12: 223.

- Hedychridium polygoni* Rohwer, 1909. Psyche 16: 87. ♀. N. syn. (R. M. Bohart).  
*violaceum* Brulle. Throughout U. S., Canada and northern Mexico.  
*Hedychrum violaceum* Brulle, 1846. Hist. Nat. Ins. Hym., v. 4, p. 51. ♂.  
*Hedychrum affinissimum* Bischoff, 1910. Berlin Zool. Mus., Mitt. 4: 444. ♀. N. syn. (R. M. Bohart).  
*wiltii* Cresson. Ark., Tex., Colo., Ariz.  
*Hedychrum Wiltii* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 305. ♂.

## SUBFAMILY CHRYSIDIDINAE

Members of this subfamily have as hosts a wide variety of wasps and bees, including species that nest in the ground, in cavities in wood, or that construct nests of mud.

## Genus CHRYSIS Linnaeus

## Genus CHRYSIS Subgenus CHRYSIS Linnaeus

- Chrysis* Linnaeus, 1761. Fauna Suecica, Ed. 2, p. 414.  
 Type-species: *Sphex ignita* Linnaeus. Desig. by Latreille, 1810.  
*Chrysis* subg. *Tetrachrysis* Lichtenstein, 1876. Petites Nouv. Ent., v. 2, p. 27.  
 Type-species: *Chrysis aeruginosa* Dahlbom. Desig. by Ashmead, 1902 (= *Chrysis succincta* Linnaeus).  
*Chrysis* subg. *Hexachrysis* Lichtenstein, 1876. Petites Nouv. Ent., v. 2, p. 27.  
 Type-species: *Chrysis micans* Rossi. Desig. by Bodenstein, 1939 (= *Chrysis sexdentata* Christ).  
*Chrysis* subg. *Actinochrysis* Haupt, 1956. [Dresden] Mus. f. Tierkunde u. Voelkerk., Abhandl. u. Ber. 23: 74.  
 Type-species: *Chrysis succincta* Linnaeus. Orig. desig.  
*Chrysis* subg. *Cymatochrysis* Haupt, 1956. [Dresden] Mus. f. Tierkunde u. Voelkerk., Abhandl. u. Ber. 23: 74.  
 Type-species: *Chrysis viridula* Linnaeus. Orig. desig.

Only the typical subgenus occurs in North America, but it has been divided into a number of species groups.

Taxonomy: Bohart, 1962. Acta Hym. 1: 361-375, 25 figs. (hexadentate species).

## SPECIES GROUP DORSALIS

- alfkenella* du Buysson. Western U. S. to Nebr., Ark.  
*Chrysis* (*Tetrachrysis*) *Alfkenella* du Buysson, 1904. Rev. Ent. Caen 23: 266. ♂.  
*dorsalis* Aaron. Transcontinental in U. S. and Canada. Host: *Photopsis* sp.  
*Chrysis dorsalis* Aaron, 1885. Amer. Ent. Soc., Trans. 12: 234. ♂, ♀.  
 Biology: Ferguson, 1962. Univ. Calif. Pubs. Ent. 27: 29 (host record).  
*meta* Aaron. Colo., Wyo., Mont., Alta.  
*Chrysis meta* Aaron, 1885. Amer. Ent. Soc., Trans. 12: 234. ♂, ♀.  
*montana* Aaron. Ont. and Maine south to Fla., Tex., Mich., Ill., Iowa, Mo., Kans., Nebr., Colo., Mont., Idaho, Utah, Calif.  
*Chrysis montana* Aaron, 1885. Amer. Ent. Soc., Trans. 12: 234. ♀.  
*Chrysis hirsuta* Aaron, 1885. Amer. Ent. Soc., Trans. 12: 235. ♂, ♀. Preocc. N. syn. (R. M. Bohart).  
*Chrysis* (*Tetrachrysis*) *aaroni* Mocsary, 1889. Monog. Chrysid., p. 386.  
*Chrysis* (*Tetrachrysis*) *equidens* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 193. N. syn. (R. M. Bohart).  
*Chrysis* (*Hexachrysis*) *nana* Mocsary, 1913. Mus. Nat. Hungarici, Ann. 11: 33. ♂. N. syn. (R. M. Bohart).

Taxonomy: Krombein, 1958. Amer. Ent. Soc., Trans. 84: 145-146, fig. 6 (*equidens* redescription). — Bohart, 1962. Acta Hym. 1: 375 (synonymy of *hirsuta* and *nana*).  
*provancheri* Schulz. Maine, Ont., Minn., S. Dak., N. Dak., Alta., N. W. T.  
*Chrysis aurichalcea* Provancher, 1881. Nat. Canad. 12: 300. ♀. Preocc.

- Chrysis Provancheri* Schulz, 1906. *Spolia Hym.*, p. 154. N. name.  
*scitula* Cresson. Colo., Utah, Calif.  
*Chrysis scitula* Cresson, 1865. *Ent. Soc. Phila., Proc.* 4: 308. ♀.  
*Chrysis Californica* Gribodo, 1879. *Mus. Civ. Stor. Nat. Genova, Ann.* 14: 336. ♀. N. syn. (R. M. Bohart).  
*tenuicornis* Taylor. Oreg., Calif., Ariz., N. Mex.; Mexico (Baja California, Jalisco, Durango).  
*Chrysis (Tetrachrysis) tenuicornis* Taylor, 1924. *Calif. Acad. Sci., Proc.* (4)13: 327. ♀.  
 Taxonomy: Bohart, 1962. *Acta Hym.* 1: 373, figs. 3, 15.

## SPECIES GROUP CONICA

- conica* Brulle. D. C. to Fla., Ky., Tenn., Tex., Ariz.; Mexico. Host: *Eumenes fraternus* Say in mud nests.  
*Chrysis conica* Brulle, 1846. *Hist. Nat. Ins. Hym.*, v. 4, p. 32. ♂, ♀.  
*Chrysis peracuta* Aaron, 1885. *Amer. Ent. Soc., Trans.* 12: 237. ♀.  
*Chrysis peregrina* du Buysson, 1887. *Rev. d'Ent.* 6: 188. ♀.  
 Morphology: Snodgrass, 1941. *Smithsn. Inst., Misc. Collect.* 99, no. 14, pp. 42, 43, pl. 13, fig. O (male genitalia).

## SPECIES GROUP DERIVATA

- amala* Rohwer. Mass., Iowa, Minn., Kans., Colo., N. Mex., Utah, Nev., Mont., Wash.  
*Chrysis (Tetrachrysis) amala* Rohwer, 1909. *Psyche* 16: 91. ♀.  
*antennalis* Mocsary. Tex., N. Mex., Ariz.; northern Mexico.  
*Chrysis (Tetrachrysis) antennalis* Mocsary, 1912. *Mus. Nat. Hungarici, Ann.* 10: 564. ♂.  
*barri* Bohart. Idaho, Nev., Calif. Host: *Parancistrocerus toltecus* (Sauss.) nesting in twig cavities.  
*Chrysis barri* Bohart, 1966. *Biol. Soc. Wash., Proc.* 79: 132. ♂, ♀.  
 Biology: Parker and Bohart, 1966. *Pan-Pacific Ent.* 42: 93 (host record).  
*derivata* du Buysson. Transcontinental in U. S. and southern Canada. Host: *Ancistrocerus catkill halophilus* Vier.; *Euodynerus foraminatus apokensis* (Robt.), *E. f. scutellaris* (Sauss.); *Symmorphus cristatus nevadensis* (Cam.). Undoubtedly parasitizes a number of other eumenid wasps nesting in cavities in twigs or borings in wood.  
*Chrysis (Tetrachrysis) derivata* du Buysson, 1891. *Rev. Ent. Caen* 10: 38. ♂.  
*Chrysis (Tetrachrysis) decepta* Rohwer, 1909. *Psyche* 16: 90. ♀. N. syn. (R. M. Bohart).  
 Biology: Parker and Bohart, 1966. *Pan-Pacific Ent.* 42: 92-94 (host record). —Krombein, 1967. *Trap-nesting wasps and bees*, p. 462 (life history).  
*irwini* Bohart. Calif., Oreg. Host: Eumenidae in twigs.  
*Chrysis irwini* Bohart, 1966. *Biol. Soc. Wash., Proc.* 79: 133. ♂, ♀.  
 Biology: Parker and Bohart, 1966. *Pan-Pacific Ent.* 42: 98 (host record).  
*pattoni* Aaron. Transcontinental in U. S., Sask., B. C. Host: *Ancistrocerus spilogaster* Cam.; *Leptochilus washo* Prkr.; *Microdynerus bakerianus* (Cam.). Hosts nest in cavities in twigs.  
*Chrysis Pattoni* Aaron, 1885. *Amer. Ent. Soc., Trans.* 12: 235. ♀.  
 Biology: Parker and Bohart, 1966. *Pan-Pacific Ent.* 42: 93 (host record). —Parker and Bohart, 1968. *Pan-Pacific Ent.* 44: 2-3 (host records). —Parker, 1970. *Pan-Pacific Ent.* 46: 242 (host record).  
*snowi* Viereck. U. S. and Canada west of 100th meridian.  
*Chrysis (Tetrachrysis) snowi* Viereck, 1906. *Amer. Ent. Soc., Trans.* 32: 195.  
*stenodyneri* Krombein. Transcontinental in U. S., south to Panama. Host: *Stenodynerus h. histronalis* (Robt.), *S. krombeini* Boh., *S. lineatifrons* Boh.; *Parancistrocerus histrio* (Lep.); *Microdynerus bakerianus* (Cam.).  
*Chrysis (Chrysis) stenodyneri* Krombein, 1958. *Amer. Ent. Soc., Trans.* 84: 151, figs. 1, 2, 8. ♀, ♂.



Biology: Krombein, 1958. Amer. Ent. Soc., Trans. 84: 155-160 (life history). — Krombein, 1967. Trap-nesting wasps and bees, pp. 471-472 (life history). — Parker, 1970. Pan-Pacific Ent. 46: 242 (host record).

## SPECIES GROUP SMARAGDULA

- Taxonomy:** Bohart, 1962. Acta Hym. 1: 362-363, figs. 16, 21-25 (group characters).
- arizonica** Bohart. Tex., N. Mex., Ariz.; northern Mexico. Host: *Euodynerus guerrero* (Sauss.); *Parancistrocerus toltecus* (Sauss.). Hosts nest in borings in wood.
- Chrysis arizonica* Bohart, 1962. Acta Hym. 1: 366, figs. 2, 10, 18, 19. ♂, ♀.
- Biology:** Krombein, 1967. Trap-nesting wasps and bees, pp. 455-456 (life history).
- bequaerti** Bohart. D. C., Ga., Ark., Mo., Iowa, Ill., Ind., S. Dak. to Tex., N. Mex.
- Chrysis bequaerti* Bohart, 1962. Acta Hym. 1: 366, figs. 7, 9, 20, 21, 25. ♂, ♀.
- clara** Cresson. S. Dak., Colo., Wash.
- Chrysis clara* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 313. ♀.
- Taxonomy:** Bohart, 1962. Acta Hym. 1: 367.
- inaequidens** Dahlbom. Over most of U. S., N. Y. to Wash. and south into Mexico (Chihuahua, Nuevo Leon, Baja California). Host: *Euodynerus foraminatus apopkensis* (Robt.), *E. foraminatus scutellaris* (Sauss.), *E. megaera* (Lep.); *Monobia quadridens* (L.); *Pachodynerus erynnis* (Lep.); *Stenodynerus pulvinatus surrufus* Krom.; *Parancistrocerus scalaris rufulus* (Boh.). Undoubtedly parasitizes a number of other eumenid wasps nesting in borings in wood or abandoned mud-dauber nests.
- Chrysis inaequidens* Dahlbom, 1854. Hym. Europaea, v. 2, p. 334. ♂.
- Chrysis Texana* Gribodo, 1879. Mus. Civ. Stor. Nat. Genova, Ann. 14: 829. ♂, ♀.
- Taxonomy:** Bohart, 1962. Acta Hym. 1: 368, fig. 14.
- Biology:** Krombein, 1958. Amer. Ent. Soc., Trans. 84: 161-163 (life history). — Moore and Parker, 1962. Pan-Pacific Ent. 38: 14 (host record). — Krombein, 1967. Trap-nesting wasps and bees, pp. 463-465 (life history).
- intricata** Brulle. Tex. (Brownsville); Mexico south to Brazil.
- Chrysis intricata* Brulle, 1846. Hist. Nat. Ins. Hym., v. 4, p. 25. ♀.
- Chrysis smidti* Dahlbom, 1845. Hym. Europaea v. 2, p. 317. ♀.
- Chrysis cognata* Gribodo, 1879. Mus. Civ. Stor. Nat. Genova, Ann. 14: 328. ♀.
- Chrysis proxima* Cameron, 1888. Biol. Cent.-Amer., Hym. v. 1, p. 465. ♀.
- Chrysis (Hexachrysis) schultzei* Mocsary, 1889. Monog. Chrysid., p. 572. ♂.
- Chrysis (Hexachrysis) aenescens* Mocsary, 1889. Monog. Chrysid., p. 577. ♀.
- Chrysis aperta* du Buysson, 1898 (1897). Ann. Soc. Ent., France 66: 559. ♂.
- Taxonomy:** Bohart, 1962. Acta Hym. 1: 368, fig. 16.
- oraria** Bohart. Ariz., N. Mex., Tex.
- Chrysis oraria* Bohart, 1962. Acta Hym. 1: 370. ♂, ♀.
- praestans** du Buysson. Ky., Colo. to Tex., west to Wash. and Calif., B. C., Alta., Man.; West Indies (Grenada).
- Chrysis praestans* du Buysson, 1898. Rev. Ent. Caen 17: 144. ♀.
- Taxonomy:** Bohart, 1962. Acta Hym. 1: 370, fig. 8.
- serrata** Taylor. U. S. west of 100th meridian, B. C.
- Chrysis (Hexachrysis) serrata* Taylor, 1924. Calif. Acad. Sci., Proc. (4)13: 329. ♂, ♀.
- Taxonomy:** Bohart, 1962. Acta Hym. 1: 371, fig. 12.
- smaragdula** Fabricius. N. J. to Fla., Ky., Mo., La., N. Mex., Ariz., Utah. Host: *Monobia quadridens* Fabr. Hosts nest in borings in wood.
- Chrysis smaragdula* Fabricius, 1775. Systema Ent., p. 357.
- Chrysis pensylvanica* Lepeletier, 1846. Hist. Nat. Ins. Hym., v. 4, p. 24. ♀.
- Taxonomy:** Bohart, 1962. Acta Hym. 1: 371, fig. 13.
- Biology:** Krombein, 1958. Amer. Ent. Soc., Trans. 84: 163 (life history). — Krombein, 1967. Trap-nesting wasps and bees, pp. 469-471 (life history).

*wasbaueri* Bohart. Generally distributed over U. S., Mass. to Wash., south to Mexico (Chihuahua, Nuevo Leon, Durango).

*Chrysis wasbaueri* Bohart, 1962. Acta Hym. 1: 372, figs. 11, 22, 23, 24. ♂, ♀.

#### SPECIES GROUP LAUTA

Taxonomy: Bohart, 1964. Biol. Soc. Wash., Proc. 77: 223-228, figs. 3, 6, 17, 20, 21, 24, 25 (group characters and descriptions of all species except *tripartita* Aar.).

*coloradica* Bohart. Oreg., Calif., Nev., Idaho, Wyo., Colo., Utah, Ariz. Host: *Anthidium collectum* Huard, in ground nests.

*Chrysis pulcherrima* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 311. ♂. Preocc.

*Chrysis coloradica* Bohart, 1964. Biol. Soc. Wash., Proc. 77: 224. N. name.

Biology: Bohart, 1964. Biol. Soc. Wash., Proc. 77: 225 (host record).

*florissanticola* Rohwer. Alaska, Yukon, Alta., Wash., Calif., Utah, Wyo., Colo. Host: *Anthidium banningense* Ckll.

*Chrysis (Tetrachrysis) florissanticola* Rohwer, 1909. Psyche 16: 88. ♂.

*Chrysis florissantensis* (!) Bohart, 1962. Acta Hym. 1: 363.

Biology: Grigarick and Stange, 1968. Calif. Insect Survey, Bul. 9: 15 (host record).

*lauta* Cresson. N. C., Ga., Miss., Tex., Kans., Nebr., Colo., N. Mex., Ariz.; Mexico (Morelos, Jalisco, San Luis Potosi, Oaxaca.) Host: *Anthidium porterae* Ckll.

*Chrysis lauta* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 310. ♀.

*Chrysis prasinus* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 310. ♀. Preocc.

*Chrysis chlorophana* Mocsary, 1887. Termes. Fuzetek 11: 16. N. name.

*Chrysis (Tetrachrysis) clypeata* Mocsary, 1889. Monog. Chrysid., p. 393. ♂.

*Chrysis (Tetrachrysis) falsifica* du Buysson, 1891. Rev. Ent. Caen 10: 38. N. name.

Taxonomy: Bohart, 1964. Biol. Soc. Wash., Proc. 77: 224 (synonymy).

Biology: Custer, 1928. Ent. News 39: 123-134.

*tripartita* Aaron. Ga., Mo., Kans., Colo., Tex. west to Calif.; northern Mexico. Host: *Anthidium collectum* Huard; *A. maculosum* Cr. Hosts nest in ground or in twig cavities.

*Chrysis tripartita* Aaron, 1885. Amer. Ent. Soc., Trans. 12: 238. ♀.

*Chrysis (Tetrachrysis) indeterminabilis* Bischoff, 1910. Berlin Zool. Mus., Mitt. 4: 476. ♀. N. syn. (R. M. Bohart).

Biology: Grigarick and Stange, 1968. Calif. Insect Survey, Bul. 9: 19 (host record). —Horning, 1971. Ent. Soc. Wash., Proc. 73: 43 (host record).

*tularensis* Bohart. Calif. (Tulare Co.).

*Chrysis tularensis* Bohart, 1962. Acta Hym. 1: 373, figs. 4, 6. ♂, ♀.

*vagabunda* Bohart. Calif., Oreg., Wash., Idaho, Nev., Utah, Ariz. Host: *Anthidium collectum* Huard.

*Chrysis vagabunda* Bohart, 1964. Biol. Soc. Wash., Proc. 77: 225, figs. 24, 25. ♂, ♀.

*xerophila* Bohart. Calif.

*Chrysis xerophila* Bohart, 1964. Biol. Soc. Wash., Proc. 77: 226, figs. 3, 20, 21. ♂, ♀.

#### SPECIES GROUP NISSERI

*nisseri* Dahlbom. N. J. to Fla., Mo., Ark., Tex.; Mexico, Central and South America.

*Chrysis nisseri* Dahlbom, 1845. Dispos. Method. Spec. Hym., pt. 2, p. 14. ♀.

*Chrysis (Tetrachrysis) propinqua* Mocsary, 1889. Monog. Chrysid., p. 343. ♂, ♀. N. syn. (R. M. Bohart).

*Chrysis (Tetrachrysis) laminifera* Bischoff, 1910. Berlin Zool. Mus., Mitt. 4: 460. ♀. N. syn. (R. M. Bohart).

*Chrysis (Tetrachrysis) chiriquensis* Bischoff, 1910. Berlin Zool. Mus., Mitt. 4: 461. ♀. N. syn. (R. M. Bohart).

*Chrysis (Tetrachrysis) palifera* Bischoff, 1910. Berlin Zool. Mus., Mitt. 4: 461. ♂. N. syn. (R. M. Bohart).

Taxonomy: Krombein, 1958. Amer. Ent. Soc., Trans. 84: 149, fig. 3.

## SPECIES GROUP FUSCIPENNIS

**fuscipennis** Brulle. D. C., Md., Va., Ky., Calif.; Hawaii; Palaearctic, Oriental, Australian.

Probably adventive from Hawaii. Host: *Sceliphron caementarium* (Dru.) in U. S.;

*Eumenes conica* (F.) in India, *Sceliphron* spp. in Japan. Hosts are resting mature larvae of mud-daubers.

*Chrysis fuscipennis* Brulle, 1846. Hist. Nat. Ins. Hym., v. 4, p. 38. ♀.

*Chrysis erratica* Abeille de Perrin, 1887. In Buysson, Rev. d'Ent. 6: 189. ♂, ♀.

*Chrysis pulchellus* Cameron, 1888. Manchester Lit. and Phil. Soc., Mem. and Proc. 26: 126. Preocc.

Taxonomy: Krombein, 1956. Ent. Soc. Wash., Proc. 58: 275.

Biology: Stage, 1960. Pan-Pacific Ent. 36: 191-195, 1 pl. (life history).

## SPECIES GROUP VENUSTA

Taxonomy: Bohart, 1964. Biol. Soc. Wash., Proc. 77: 233-235, figs. 8, 9, 10, 12, 13 (group characters and descriptions of all species except *venusta* Cr.).

**australia** Bohart. Oreg., Calif., Nev., Utah, Ariz., N. Mex.; Mexico (Baja California, Sonora, Zacatecas, Morelos, Jalisco).

*Chrysis australia* Bohart, 1964. Biol. Soc. Wash., Proc. 77: 233, figs. 8, 13. ♂, ♀.

**venusta** Cresson. Kans., Colo., Tex., N. Mex., Calif.

*Chrysis venusta* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 311. ♂.

*Chrysis (Tetrachrysis) frey-gessneri* Gribodo, 1879. Mus. Civ. Stor. Nat. Genova, Ann. 14: 333. ♀. N. syn. (R. M. Bohart).

Taxonomy: Bohart, 1964. Biol. Soc. Wash., Proc. 77: 232, fig. 10 (male genitalia).

**venustella** Bohart. Wash., Oreg., Calif., Nev., Idaho, Wyo.

*Chrysis venustella* Bohart, 1964. Biol. Soc. Wash., Proc. 77: 235, figs. 9, 12. ♂, ♀.

## SPECIES GROUP PROPRIA

Taxonomy: Bohart, 1964. Biol. Soc. Wash., Proc. 77: 228-233, figs. 1, 2, 5, 7, 11, 17 (group characters and descriptions of new species only).

**aridula** Bohart. Ariz., southern Calif.

*Chrysis aridula* Bohart, 1962. Acta Hym. 1: 364, figs. 1, 5, 17. ♂, ♀.

**crotema** Bohart. N. Mex., Ariz.; Mexico (Chihuahua, Zacatecas).

*Chrysis crotema* Bohart, 1964. Biol. Soc. Wash., Proc. 77: 228, figs. 5, 18, 19. ♂, ♀.

**prolata** Bohart. Kans., Iowa, Ill., Wis.

*Chrysis prolata* Bohart, 1964. Biol. Soc. Wash., Proc. 77: 229. ♀.

**propria** Aaron. Transcontinental in U. S., Alta., B. C.; Mexico (Chihuahua, Durango).

*Chrysis propria* Aaron, 1885. Amer. Ent. Soc., Trans. 12: 238. ♂, ♀.

*Chrysis (Tetrachrysis) kahli* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 194. ♂.

*Chrysis (Tetrachrysis) pattonella* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 194. ♂.

Taxonomy: Krombein, 1957. Ent. News 68: 191.

**rivalis** Bohart. Calif., Oreg., Wash., Idaho, Mont., Wyo., Utah, Colo., Nev.

*Chrysis rivalis* Bohart, 1964. Biol. Soc. Wash., Proc. 77: 229, figs. 4, 22, 23. ♂, ♀.

**submontana** Rohwer. N. Mex., Colo., Utah, Wash., Oreg., Calif.

*Chrysis (Tetrachrysis) submontana* Rohwer, 1909. Psyche 16: 91.

**tensa** Bohart. Calif., Utah, Ariz., N. Mex., Tex., Kans., Nebr.; Mexico (Sonora, Chihuahua).

*Chrysis tensa* Bohart, 1964. Biol. Soc. Wash., Proc. 77: 230, figs. 2, 14, 15. ♂, ♀.

**vibex** Bohart. Calif., Ariz., N. Mex., Tex., Okla., Kans.; Mexico (Chihuahua, Nuevo Leon, Jalisco).

*Chrysis vibex* Bohart 1964. Biol. Soc. Wash., Proc. 77: 231, figs. 1, 7, 11, 16. ♂, ♀.

## SPECIES GROUP COERULANS

Taxonomy: Moore, 1966. Ent. Soc. Amer., Ann. 59: 1125-1131, 9 figs. (group characters, synonymy and description of both sexes of included species).

**canadensis** du Buysson. Transcontinental in U. S. and Canada; Mexico (Guerrero).

*Chrysis (Tetrachrysis) canadensis* du Buysson, 1891. Rev. Ent. Caen 10: 37. ♀.

- Chrysis (Tetrachrysis) altivolans* Mocsary, 1914. Mus. Nat. Hungarici, Ann. 12: 53. ♂. N. syn. (R. M. Bohart).
- Chrysis (Tetrachrysis) coerulans* var. *nanula* Rohwer, 1909. Psyche 16: 88. ♀. N. syn. (R. M. Bohart).
- cembricola* Krombein. Transcontinental in U. S. and Canada. Host: *Symmorphus canadensis* (Sauss.). Hosts nest in borings in wood.
- Chrysis (Chrysis) cembricola* Krombein, 1958. Ent. Soc. Wash., Proc. 60: 53, fig. 1. ♀, ♂.
- Biology: Krombein, 1958. Ent. Soc. Wash., Proc. 60: 57-58 (life history). —Krombein, 1967. Trap-nesting wasps and bees, pp. 456-457 (life history).
- coerulans* Fabricius. Widely distributed in southern Canada and U. S. Host: *Ancistrocerus a. antilope* (Panz.); *A. c. catskill* (Sauss.); *A. c. albophaleratus* (Sauss.); *A. spilogaster* Cam.; *A. a. adiabatus* (Sauss.); *A. a. cytainus* (Cam.); *A. tuberculocephalus sutterianus* (Sauss.); *Euodynerus foraminatus apopkensis* (Robt.); *E. f. foraminatus* (Sauss.); *E. f. scutellaris* (Sauss.); *E. leucomelas* (Sauss.); *E. megaera* (Lep.); *Parancistrocerus acarophorus* (Boh.); *P. salcularis rufulus* (Boh.); *Symmorphus albomarginatus* (Sauss.); *S. c. cristatus* (Sauss.); *Hoplitis anthocopoides* (Schenk). Parasite: *Melittobia chalybii* Ashm. Hosts nest in cavities in twigs, borings in wood, and in old mud-dauber nests.
- Chrysis coerulans* Fabricius, 1805. Systema Piezatorum, p. 172. ♀.
- Chrysis Servillei* Brulle, 1846. Hist. Nat. Ins. Hym., v. 4, p. 37. N. syn. (R. M. Bohart).
- Chrysis bella* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 312. ♀.
- Chrysis Nortoni* Aaron, 1885. Amer. Ent. Soc., Trans. 12: 237. ♂, ♀. N. syn. (R. M. Bohart).
- Chrysis (Tetrachrysis) conserta* du Buysson, 1891. Rev. Ent. Caen 10: 37. ♀.
- Chrysis (Tetrachrysis) praticola* Mocsary, 1914. Mus. Nat. Hungarici, Ann. 12: 50. ♂, ♀. N. syn. (R. M. Bohart).
- Chrysis (Tetrachrysis) sejuncta* Mocsary, 1914. Mus. Nat. Hungarici, Ann. 12: 51. ♀. N. syn. (R. M. Bohart).
- Biology: Walsh, 1869. Amer. Ent. 1: 135 (host record, erroneous). —Ashmead, 1894. Psyche 7: 79 (host record, erroneous). —Parker, 1962. Pan-Pacific Ent. 38: 140 (host record). —Medler, 1964. Ent. News 75: 26-27 (host record). —Medler, 1964. Ent. Soc. Wash., Proc. 66: 209-215 (life history). —Medler, 1964. Ent. Soc. Amer., Ann. 57: 59 (host record). —Parker and Bohart, 1966. Pan-Pacific Ent. 42: 93 (host records). —Krombein, 1967. Trap-nesting wasps and bees, pp. 457-462 (life history). —Eickwort, 1973. Search, Agr. 3: 24 (host). —Evans, 1973. Great Basin Nat. 33: 152 (host).
- inflata* Aaron. Tex., Colo. and N. Mex. west to Calif. and Oreg., Idaho, B. C.; Mexico. Host: *Ancistrocerus durangoensis* Cam.; *A. lineativentris* Cam.; *A. tuberculocephalus sutterianus* (Sauss.); *A. t. tuberculocephalus* (Sauss.); *Euodynerus guerrero* (Sauss.). Hosts nest in cavities in twigs and in borings in wood.
- Chrysis inflata* Aaron, 1885. Amer. Ent. Soc., Trans. 12: 237. ♂, ♀.
- Chrysis Dugesii* du Buysson, 1898 (1897). Soc. Ent. France, Ann. 66: 532, pl. 18, fig. 7. ♀. N. syn. (R. M. Bohart).
- Chrysis (Tetrachrysis) nokomis* Rohwer, 1909. Psyche 16: 89. ♂, ♀. N. syn. (R. M. Bohart).
- Biology: Parker and Bohart, 1966. Pan-Pacific Ent. 42: 93 (host record). —Krombein, 1967. Trap-nesting wasps and bees, pp. 465-466 (life history).
- nitidula* Fabricius. Transcontinental in U. S. and Canada. Host: *Ancistrocerus a. antilope* (Panz.); *A. c. catskill* (Sauss.); *A. c. albophaleratus* (Sauss.); *A. a. adiabatus* (Sauss.); *Euodynerus f. foraminatus* (Sauss.); *E. schwarzi* (Krom.); *Symmorphus c. cristatus* (Sauss.). Hosts nest in cavities in stems, borings in wood, and abandoned mud cells of mining bees.
- Chrysis nitidula* Fabricius, 1775. Systema Ent., p. 359.
- Chrysis cyanea* Villers, 1789. Caroli Linnaei Ent., v. 3, p. 257.
- Chrysis (Tetrachrysis) cessata* du Buysson, 1891. Rev. Ent. Caen 10: 36.
- Chrysis (Tetrachrysis) chalcopyga* Mocsary, 1914. Mus. Nat. Hungarici, Ann. 12: 48. ♀.
- Biology: Harrington, 1896. Canad. Ent. 28: 79 (host record). —Hobbs, Nummi and Virotek, 1961. Canad. Ent. 93: 147 (host record). —Medler, 1964. Ent. Soc. Amer., Ann. 57: 59 (host

record). —Medler, 1964. Ent. Soc. Wash., Proc. 66: 209-215 (life history). —Krombein, 1967. Trap-nesting wasps and bees, pp. 466-468 (life history).

**parkeri** Moore. Que., Alta., B. C., Mont., Idaho, Utah, Nev., Oreg., Calif. Host: *Euodynerus foraminatus scutellaris* (Sauss.); *Leptochilus rufinodius* (Cr.); *Microdynerus bakerianus* (Cam.); *Parancistrocerus acarigaster* (Boh.). Hosts nest in cavities in twigs and in abandoned mud-dauber nests.

*Chrysis parkeri* Moore, 1966. Ent. Soc. Amer., Ann. 59: 1130, fig. 8. ♂, ♀.

Biology: Parker and Bohart, 1966. Pan-Pacific Ent. 42: 93 (host records). —Parker, 1970. Pan-Pacific Ent. 46: 242 (host record).

**pellucidula** Aaron. Transcontinental in U. S. and southern Canada. Host: *Trypargilum collinum rubrocinctum* (Pack.), *T. t. tridentatum* (Pack.). Hosts nest in cavities in twigs and in borings in wood.

*Chrysis pellucidula* Aaron, 1885. Amer. Ent. Soc., Trans. 12: 235. ♀.

Biology: Hicks, 1934. Univ. Colo. Studies 21: 267 (host record). —Parker and Bohart, 1966. Pan-Pacific Ent. 42: 95 (host record). —Krombein, 1967. Trap-nesting wasps and bees, p. 473 (life history). —Medler, 1967. Amer. Midland Nat. 78: 351 (host record).

**remissa** Mocsary. Pa., Va., Tex., N. Mex., Ariz.; Mexico (Zacatecas, Veracruz).

*Chrysis (Tetrachrysis) remissa* Mocsary, 1914. Mus. Nat. Hungarici, Ann. 12: 52. ♀.

### Genus CHRYSIS Subgenus PRAESTOCHRYSIS Linsenmaier

*Chrysis* subg. *Praestochrysis* Linsenmaier, 1959. Schweiz. Ent. Ges., Mitt. 32: 164.

Type-species: *Chrysis shanghaiensis* Smith. Orig. desig.

This subgenus is not a member of the Nearctic fauna.

**shanghaiensis** Smith. Liberated in Mass. in 1917-18 but not recovered since 1919; Japan, China, Thailand, India, East Indies. Introduced from China. Host: Diapausing larva, *Cnidocampa flavescens* (Wlkr.), the oriental moth.

*Chrysis Shanghaiensis* Smith, 1874. Ent. Soc. London, Trans., p. 460. ♀.

*Chrysis (Pentachrysis) himalayensis* Mocsary, 1888. In Radoszkowski, Hor. Soc. Ent. Ross. 23: 31, fig. 63. ♂.

*Chrysis (Pentachrysis) crassiscuta* Mocsary, 1889. Monog. Chrysid., p. 524. ♀.

Biology: Parker, 1936. Jour. Agr. Res. 52: 449-458 (life history, behavior).

Morphology: Parker, 1936. Jour. Agr. Res. 52: 452-455, 5 figs. (egg, larva).

### Genus CERATOCHRYSIS Cooper

*Chrysis* subg. *Ceratochrysis* Cooper, 1952. Amer. Ent. Soc., Trans. 78: 138.

Type-species: *Chrysis (Ceratochrysis) enhuycki* Cooper. Orig. desig.

Biology and host relationships are known for only a few of the included species. These meager data indicate that species of this genus parasitize eumenid and sphecoid wasps and megachilid bees nesting in cavities in twigs.

Taxonomy: Cooper, 1952. Amer. Ent. Soc., Trans. 78: 137-148. —Bohart, 1966. Kans. Ent. Soc., Jour. 39: 112-113 (redefined and raised to generic rank).

**alveata** Bohart. Calif., Ariz.

*Ceratochrysis alveata* Bohart, 1966. Kans. Ent. Soc., Jour. 39: 113, figs. 7, 11, 14. ♂, ♀.

**antya** Bohart. Calif., Nev., Ariz., N. Mex. Host: *Trypargilum t. tridentatum* (Pack.); *Pisonopsis birkmanni* Roh.

*Ceratochrysis antya* Bohart, 1966. Kans. Ent. Soc., Jour. 39: 115, figs. 6, 13. ♂, ♀.

Biology: Parker and Bohart, 1966. Pan-Pacific Ent. 42: 94-95 (host records).

**bitumida** Bohart. N. Mex. (Hidalgo Co.).

*Ceratochrysis bitumida* Bohart, 1966. Kans. Ent. Soc., Jour. 39: 116, fig. 1. ♀.

**cavicantha** Bohart. Calif., Ariz.

*Ceratochrysis cavicantha* Bohart, 1966. Kans. Ent. Soc., Jour. 39: 116, fig. 8. ♂, ♀.

- crossata* Bohart. Oreg., Calif., Nev., Utah, Ariz., N. Mex., Tex.; Mexico (Hidalgo, San Luis Potosi, Puebla, Mexico).  
*Ceratochrysis crossata* Bohart, 1966. Kans. Ent. Soc., Jour. 39: 117, figs. 2, 9, 12. ♂, ♀.
- cyanosoma* Mocsary. Wash., Oreg., Calif., Nev., Utah, Wyo.  
*Chrysis (Holoachrysis) cyanosoma* Mocsary, 1914. Mus. Nat. Hungarici, Ann. 12: 17. ♀.
- declinis* Bohart. N. B., N. S., Ont., Maine, N. H., Conn., N. Y., Mich., Wis., Minn., Sask., Colo., Alta.  
*Ceratochrysis declinis* Bohart, 1966. Kans. Ent. Soc., Jour. 39: 119, figs. 10, 15. ♂, ♀.
- enhuycki* (Cooper). N. Y. to Fla., Mo., Tex., Utah, Ariz. Host: *Leptochilus ornatus* Sauss.  
 Reared from sumac twigs.  
*Chrysis (Ceratochrysis) enhuycki* Cooper, 1952. Amer. Ent. Soc., Trans. 78: 140, figs. 3, 5, 6, 8, 9. ♀, ♂.
- Biology: Krombein, 1959. Ent. News 70: 17-23 (life history).
- faceta* (Aaron). Colo., Tex., N. Mex., Calif.  
*Chrysis faceta* Aaron, 1885. Amer. Ent. Soc., Trans. 12: 229. ♂.
- Taxonomy: Cooper, 1952. Amer. Ent. Soc., Trans. 78: 144-147, figs. 1, 4, 10 (redescription male). — Bohart, 1966. Kans. Ent. Soc., Jour. 39: 119.
- kansensis* (Viereck). Generally distributed in southern Canada and U. S. west to Alta., Wyo., Colo. and Ariz.; Mexico (Jalisco).  
*Chrysis (Gonochrysis) kansensis* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 193.
- Taxonomy: Bohart, 1966. Kans. Ent. Soc., Jour. 39: 120, fig. 19.
- Morphology: Snodgrass, 1941. Smithsn. Inst., Misc. Collect. 99, no. 14, pp. 42-43, pl. 13, figs. J-N (male genitalia).
- longiceps* Bohart. Nev., Ariz.; Mexico (Guanajuato).  
*Ceratochrysis longiceps* Bohart, 1966. Kans. Ent. Soc., Jour. 39: 120, fig. 4. ♂, ♀.
- nearctica* (Mocsary). Tex., Ariz., Calif.; Mexico (Sonora).  
*Spintharis nearctica* Mocsary, 1911. Mus. Nat. Hungarici, Ann. 9: 462. ♀.
- Taxonomy: Bohart, 1966. Kans. Ent. Soc., Jour. 39: 115, 121.
- perpulchra* (Cresson). U. S. and Canada west of 100th meridian, south to Costa Rica. Host: *Ammophila aberti* Hald.  
*Chrysis perpulchra* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 308. ♀.
- Taxonomy: Bohart, 1966. Kans. Ent. Soc., Jour. 39: 122.
- Biology: Hicks, 1932. Canad. Ent. 64: 150-151 (host record).
- quadrituberculata* (Cameron). Idaho, Tex., Ariz., south to El Salvador, Honduras.  
*Chrysis quadrituberculata* Cameron, 1888. Biol. Cent.-Amer., Hym., v. 1, p. 461, pl. 20, figs. 7, 72.
- Taxonomy: Cooper, 1952. Amer. Ent. Soc., Trans. 78: 142-144, figs. 2, 7, 11. ♂, ♀. — Bohart, 1966. Kans. Ent. Soc., Jour. 39: 119.
- thysana* Bohart. Oreg., Calif., Nev. Host: *Leptochilus periallis* Prkr.  
*Ceratochrysis thysana* Bohart, 1966. Kans. Ent. Soc., Jour. 39: 120, figs. 5, 16. ♂, ♀.
- Biology: Parker and Bohart, 1968. Pan-Pacific Ent. 44: 2 (host record).
- trachypleura* Bohart. B. C. and Mont. south to Calif., Ariz. and Colo. Host: *Ammophila aberti* Hald.  
*Ceratochrysis trachypleura* Bohart, 1966. Kans. Ent. Soc., Jour. 39: 121, figs. 3, 17. ♂, ♀.
- Biology: Hicks, 1932. Canad. Ent. 64: 150 (host; parasite misdet. as *perpulchra* Cr.).
- tuberella* Bohart. Oreg., Calif., Nev., Utah, Colo. Host: *Leptochilus rufinodius* (Cr.).  
*Ceratochrysis tuberella* Bohart, 1966. Kans. Ent. Soc., Jour. 39: 122, fig. 18. ♂, ♀.
- Biology: Parker and Bohart, 1966. Pan-Pacific Ent. 42: 93 (host record).
- unita* (Mocsary). Tex., Colo., Calif.; Mexico.  
*Chrysis (Olochrysis) unita* Mocsary, 1889. Monog. Chrysid., p. 211. ♀.

Genus **EUCHROEUS** Latreille

Taxonomy: Linsenmaier, 1968. Schweiz. Ent. Ges., Mitt. 41: 38-47.

Genus **EUCHROEUS** Subgenus **EUCHROEUS** Latreille

*Euchroeus* Latreille, 1809. Gen. Crust. Ins., v. 4, p. 578.

Type-species: *Chrysis purpuratus* Fabricius. Monotypic.

The typical subgenus does not occur in North America.

Genus **EUCHROEUS** Subgenus **PSEUDOSPINOLIA** Linsenmaier

*Euchroeus* subg. *Pseudospinolia* Linsenmaier, 1951. Schweiz. Ent. Ges., Mitt. 24: 27.

Type-species: *Chrysis uniformis* Dahlbom. Orig. desig.

**neglectus** (Shuckard). Alta., Man., Sask., Minn., N. Dak., Nebr., Mont., Colo., N. Mex.; Europe, Asia. Host: *Odynerus spinipes* (L.), *O. reniformis* (Gmel.) in Europe; putative host in North America is *O. dilectus* Sauss.

*Chrysis neglecta* Shuckard, 1837. Ent. Mag. 4: 169.

*Olochrysis semicuprea* Viereck, 1903. Amer. Ent. Soc., Trans. 29: 70. ♀. N. syn. (R. M. Bohart).

Genus **SPINTHAROSOMA** Zimmermann

*Spintharosoma* Zimmermann, 1959. Deut. Ent. Ztschr. 6: 32.

Type-species: *Spintharosoma chrysonota* Dahlbom. Orig. desig.

*Euchroeus* subg. *Hyalichroeus* Linsenmaier, 1959. Schweiz. Ent. Ges., Mitt. 32: 70.

Type-species: *Spintharosoma chrysonota* Dahlbom. Orig. desig.

Dahlbom misidentified *Spintharis* Klug. The names listed above were proposed for *Spintharis* sensu Dahlbom.

**mesillae** (Cockerell). Southern Tex. to southern Calif., Utah; Mexico (Sonora). Host:

*Ammophila breviceps* Sm.; *A. femurrubra* Fox. The host species nest in soil.

*Chrysis* (*Dichrysis*) **mesillae** Cockerell, 1894. Ent. News 5: 125. ♀.

*Chrysis* (*Dichrysis*) **bigeloviae** Cockerell, 1897. Ann. and Mag. Nat. Hist. 19: 401. ♂.

*Spintharis annulipes* Mocsary, 1911. Mus. Nat. Hungarici, Ann. 9: 462. ♂.

**trochilus** (du Buysson). U. S. west of 100th meridian; Mexico (Sonora).

*Chrysis* (*Spintharis*) **trochilus** du Buysson, 1891. Rev. Ent. Caen 10: 32. ♀.

Genus **CHRYSTURA** Dahlbom

*Chrysura* Dahlbom, 1845. Dispos. Method. Spec. Hym., pt. 2, p. 6.

Type-species: *Chrysis austriaca* Fabricius. Desig. by Bodenstein, 1939.

*Chrysogona* Foerster, 1853. Naturh. Ver. Rheinlande, Verh. 10: 327.

Type-species: *Chrysogona gracillima* Foerster. Monotypic.

*Chrysis* subg. *Olochrysis* Lichtenstein, 1876. Petites Nouv. Ent., v. 2, p. 27.

Type-species: *Chrysis aerata* Dahlbom. Desig. by Ashmead, 1902 (= *Chrysis trimaculata* Foerster).

*Chrysis* subg. *Monochrysis* Lichtenstein, 1876. Petites Nouv. Ent., v. 2, p. 27.

Type-species: *Chrysis hybrida* Lepeletier. Desig. by Ashmead, 1902.

*Holochrysis* Rye, 1878. Zool. Record for 1876, v. 13, Ins., p. 134. Emend.

*Chrysoura* Dalla Torre, 1892. Cat. Hym., v. 6, p. 40. Emend.

*Chrysis* subg. *Arctochrysis* Haupt, 1956. [Dresden] Mus. f. Tierkunde u. Voelkerk., Abhandl. u. Ber. 23: 72.

Type-species: *Chrysis austriaca* Fabricius. Orig. desig.

*Chrysis* subg. *Taeniochrysis* Haupt, 1956. [Dresden] Mus. f. Tierkunde u. Voelkerk., Abhandl. u. Ber. 23: 72.

Type-species: *Chrysis dichroa* Dahlbom. Orig. desig.

*Chrysis* subg. *Selenochrysis* Haupt, 1956. [Dresden] Mus. f. Tierkunde u. Voelkerk., Abhandl. u. Ber. 23: 72.

Type-species: *Chrysis candens* Germar. Orig. desig.

*Chrysis* subg. *Ischnochrysis* Haupt, 1956. [Dresden] Mus. f. Tierkunde u. Voelkerk., Abhandl. u. Ber. 23: 73.

Type-species: *Chrysis gracillima* Foerster. Orig. desig.

The known life histories indicate that the female *Chrysura* deposits her egg in a host cell at the time that it is being provisioned. The parasite egg hatches after that of the host and the newly hatched *Chrysura* larva attaches to the host body, imbibes a small amount of body fluids, but does not molt until the host larva spins its cocoon and enters the resting stage. The *Chrysura* larva then molts, devours the host larva, and spins its cocoon within that of the host. Development to the adult stage and emergence from the nest is synchronized with the host. In vernal univoltine species the host and parasite transform to adults late in the summer and overwinter in the cocoons.

In addition to the hosts listed below for some of the species, Thorp (1968. Kans. Ent. Soc., Jour. 41: 324-331) published life history notes on a species near *pacifica* (Say) which parasitized *Proteridiades bunoccephala* (Mich.) in California.

**boharti** Horning. B. C., Wash., Idaho, Calif., Wyo.

*Chrysura boharti* Horning, 1971. Pan-Pacific Ent. 47: 29, figs. 2, 5, 8, 9, 11, 13. ♂, ♀.

**cobaltina** (Aaron). Mass., Mich., Ind., Ill., Mont., Wyo., Utah, Calif., Wash., B. C.

*Chrysis cobaltina* Aaron, 1885. Amer. Ent. Soc., Trans. 12: 228. ♀.

*Chrysis lateri-dentata* Aaron, 1885. Amer. Ent. Soc., Trans. 12: 228. ♀.

**crenscentis** Horning. U. Sonor. and Transit. Zones in central and southern California.

*Chrysura crensis* Horning, 1971. Pan-Pacific Ent. 47: 27, figs. 1, 3, 4, 6, 7, 10, 12. ♂, ♀.

**densa** (Cresson). Wash., Idaho, Oreg., Calif., Nev., Utah, Ariz., Wyo., Colo., Tex. Host:

*Pseudomasaris edwardsii* (Cr.); *P. vespoides* (Cr.); *P. zonalis* (Cr.). Hosts nest in mud cells attached to rocks.

*Chrysura densa* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 307. ♀.

Biology: Hicks, 1927. Canad. Ent. 59: 78 (host record). — Hicks, 1929. Canad. Ent. 61: 122 (host record).

**inuitata** Aaron. B. C., Oreg., Calif., Utah, Colo., N. Y., Va.

*Chrysis inuitata* Aaron, 1885. Amer. Ent. Soc., Trans. 12: 227. ♂.

*Chrysis optima* Aaron, 1885. Amer. Ent. Soc., Trans. 12: 227. ♀.

*Chrysis (Holochochrysis) interfata* du Buysson, 1908. Rev. Ent. Caen 27: 208.

**kyrae** Krombein. Md. to Ga., Ind., Mo., Colo., Utah, Idaho, B. C., Wash., Oreg., Calif. Host:

*Osmia l. lignaria* Say in borings in wood.

*Chrysura kyrae* Krombein, 1963. Ent. News 74: 150. ♂, ♀.

Biology: Krombein, 1963. Ent. News 74: 152 (life history). — Krombein, 1967. Trap-nesting wasps and bees, pp. 444-445, figs. 87, 88, 128-130 (life history).

**martia** (Patton). Lower Canada, Mich.

*Chrysis martia* Patton, 1879. Canad. Ent. 11: 67-68.

**pacifica** (Say). Transcontinental in U. S. and Canada. Host: *Osmia kincaidii* Ckll., *O. pumila* Cr., *O. tanneri* Sandh., *O. georgica* Cr., *O. nigrifrons* Cr., *O. coloradensis* Cr. Predator: *Phylanthus pulcher* D. T.

*Chrysis pacifica* Say, 1828. Contrib. Maclur. Lyc. Phila. 1: 82.

*Chrysis hilaris* Dahlbom, 1854. Hym. Europaea, v. 2, p. 103.

*Chrysis halictula* Gribodo, 1874. Mus. Civ. Stor. Genova, Ann. 6: 359.

*Chrysis resecta* Gribodo, 1879. Mus. Civ. Stor. Nat. Genova, Ann. 14: 336. N. syn. (R. M. Bohart).

Taxonomy: Krombein, 1963. Ent. News 74: 149-150. — Horning, 1971. Pan-Pacific Ent. 47: 31.

Biology: Parker and Bohart, 1966. Pan-Pacific Ent. 42: 97 (host record). — Krombein, 1967.

Trap-nesting wasps and bees, pp. 446-447, fig. 131 (life history). — Parker, 1975.

Pan-Pacific Ent. 51: 182 (host). — Hawkins, 1975. Kans. Ent. Soc., Jour. 48: 498 (host).

**smaragdicolor** (Walker) B. C. to Calif., Idaho, Wyo., Utah, N. Mex., Colo., N. Dak. Host:

*Osmia longula* Cr.

*Chrysura smaragdicolor* Walker, 1866. In Lord, Naturalist in Vancouver Isl. and B. C., v. 2, p. 343.



Taxonomy: Krombein, 1963. Ent. News 74: 149.

Biology: Leech, 1948. Ent. Soc. Brit. Columbia, Proc. 44: 27 (host record).

**sonorensis** (Cameron). Idaho, Oreg., Calif., Utah, Ariz., N. Mex.; Mexico (Baja California).  
Host: *Ashmeadiella aridula* Ckll.; *A. bigeloviae* (Ckll.); *A. buconis denticulata* (Cr.); *A. occipitalis* Mich.; *Hoplitis producta gracilis* (Mich.); *Anthocopa c. copelandica* (Ckll.); *A. c. albomarginata* (Ckll.); *Osmia kincaidii* Ckll. Hosts nest in cavities in twigs or in borings in wood.

*Chrysis Sonorensis* Cameron, 1888. Biol. Cent.-Amer., Hym., v. 1, p. 461.

Biology: Parker and Bohart, 1966. Pan-Pacific Ent. 42: 96-97 (host records). — Parker, 1967. Pan-Pacific Ent. 43: 215 (host record). — Krombein, 1967. Trap-nesting wasps and bees, pp. 447-449 (life history). — Parker and Bohart, 1968. Pan-Pacific Ent. 44: 4 (host record). — Parker, 1975. Pan-Pacific Ent. 51: 119 (host).

**tota** (Aaron). Md., Iowa, Colo., Idaho, Utah, Calif., B. C.

*Chrysis integra* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 306-307. ♂. Preocc.

*Chrysis tota* Aaron, 1885. Amer. Ent. Soc., Trans. 12: 228. N. name.

*Chrysis elongata* Mocsary, 1887. Termes., Fuzetek 11: 15. N. name.

### Genus NEOCHRYISIS Linsenmaier

Taxonomy: Bohart, 1966 (1963). Brooklyn Ent. Soc., Bul. 58: 139-144 (generic reclassification).

#### Genus NEOCHRYISIS Subgenus NEOCHRYISIS Linsenmaier

*Pleurocera* subg. *Neochrysis* Linsenmaier, 1959. Schweiz. Ent. Ges., Mitt. 32: 74.

Type-species: *Chrysis punctatissima* Spinola. Orig. design.

**montezuma** (Cameron). Southern Ariz. south to Yucatan.

*Chrysis montezuma* Cameron, 1888. Biol. Cent.-Amer., Hym., v. 1, p. 463. ♀.

#### Genus NEOCHRYISIS Subgenus EXOCHRYISIS Bohart

*Neochrysis* subg. *Erochrysis* Bohart, 1966 (1963). Brooklyn Ent. Soc., Bul. 58: 141.

Type-species: *Chrysis panamensis* Cameron. Orig. design.

**panamensis** (Cameron). Pa. to Fla., Ind., Okla., south to Panama. Ecology: Hosts nest in borings in wood. Host: *Podium rufipes* (F.); *P. luctuosum* Sm.?

*Chrysis Panamensis* Cameron, 1888. Biol. Cent.-Amer., Hym., v. 1, p. 464, pl. 20, fig. 8. ♀.

*Chrysis (Tetrachrysis) alabamensis* Mocsary, 1914. Mus. Nat. Hungarici, Ann. 12: 49. ♀.

Taxonomy: Krombein, 1958. Amer. Ent. Soc., Trans. 84: 149, fig. 4. — Bohart and Menke, 1963. Univ. Calif. Pubs. Ent. 30: 108 (synonymy). — Bohart, 1966 (1963). Brooklyn Ent. Soc., Bul. 58: 141. ♀, ♂.

Biology: Krombein, 1958. Amer. Ent. Soc., Trans. 84: 147-149 (life history). — Krombein, 1967. Trap-nesting wasps and bees, pp. 473-475 (life history).

#### Genus NEOCHRYISIS Subgenus IPSIURA Linsenmaier

*Ipsiura* Linsenmaier, 1959. Schweiz. Ent. Ges., Mitt. 32: 74.

Type-species: *Chrysis marginalis* Brulle. Orig. design.

**genbergi** (Dahlbom). Fla.; Brazil, Argentina.

*Chrysis genbergi* Dahlbom, 1854. Hym. Europaea, v. 2, p. 319. ♀.

**neolateralis** Bohart. D. C., Va., Ga., Ill., Kans., Ark. south to El Salvador.

*Neochrysis (Ipsiura) neolateralis* Bohart, 1966 (1963) Brooklyn Ent. Soc., Bul. 58: 143. ♂, ♀.

**pilifrons** (Cameron). Southern Tex. to southern Mexico.

*Chrysis pilifrons* Cameron, 1888. Biol. Cent.-Amer., Hym., v. 1, p. 465. ♂.

*Chrysis (Hexachrysis) stenops* Mocsary, 1889. Monog. Chrysid., p. 571. ♀.

### Genus TRICHRYISIS Lichtenstein

*Chrysis* subg. *Trichrysis* Lichtenstein, 1876. Petites Nouv. Ent., v. 2, p. 27.

Type-species: *Sphex cyaneus* Linnaeus. Monotypic.

*Chrysis* subg. *Alocochrysis* Haupt, 1956. [Dresden] Mus. f. Tierkunde u. Voelkerk., Abhandl. u. Ber. 23: 73.

Type-species: *Chrysis cyaneus* Linnaeus. Monotypic.

The hosts of *Trichrysis*, so far as known, nest in cavities in twigs, borings in wood or abandoned nests of mud-daubers.

**areolata** (Mocsary). Md., Tenn., Tex.; Mexico (Guerrero).

*Chrysogona areolata* Mocsary, 1911. Mus. Nat. Hungarici, Ann. 9: 463. ♀.

**carinata** (Say). Mass. to Fla., W. Va., Wis., Mo., Kans., Colo., Tex. Host: *Trypargilum c. collinum* (Sm.); *T. collinum rubrocinctum* (Pack.); *T. clavatum* (Say); *T. striatum* (Prov.).

*Chrysis carinata* Say, 1828. Contrib. Maclur. Lyc. Phila. 1: 82.

Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 450-454, figs. 132, 133 (?), 134 (life history).

**deversor** Bohart. B. C. to Calif., Idaho, Mont., Nev., Utah, Colo. Host: *Trypargilum t. tridentatum* (Pack.).

*Trichrysis deversor* Bohart, 1966. Biol. Soc. Wash., Proc. 79: 131. ♂, ♀.

Biology: Parker and Bohart, 1966. Pan-Pacific Ent. 42: 95 (host record).

**doriae** (Gribodo). Southern Canada and U. S. south to Panama. Host: *Trypargilum collinum rubrocinctum* (Pack.); *Trypoxylon backi* Sandh.; *T. bidentatum* Fox; *T. fastigium* Fox; *T. frigidum* Sm.; *T. sculleni* Sandh.

*Chrysis Doriae* Gribodo, 1874. Mus. Civ. Stor. Nat. Genova, Ann. 6: 359.

*Chrysis verticalis* Patton, 1879. Canad. Ent. 11: 67. ♂.

*Chrysis striatellus* Norton, 1879. Amer. Ent. Soc., Trans. 7: 241. ♀.

*Chrysis discreta* Aaron, 1885. Amer. Ent. Soc., Trans. 12: 230. ♀.

Biology: Thomas, 1962. Amer. Midland Nat. 67: 365-366 (life history). — Thomas, 1963. Mich.

Acad. Sci., Arts, Letters, Papers 48: 127-130 (life history). — Parker and Bohart, 1966.

Pan-Pacific Ent. 42: 95 (host records). — Krombein, 1967. Trap-nesting wasps and bees, pp. 449-450 (life history). — Medler, 1967. Amer. Midland Nat. 78: 350 (host record).

**mucronata** (Brulle). ? Canada, Tex., Ariz., Calif.; south to Venezuela. Host: *Trypargilum t. tridentatum* (Pack.); *Euodynerus p. pratensis* (Sauss.).

*Chrysis mucronata* Brulle, 1846. Hist. Nat. Ins. Hym., v. 4, p. 45. ♀.

Taxonomy: Bohart, 1966. Biol. Soc. Wash., Proc. 79: 132.

Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 454-455 (life history).

**tridens** (Lepeletier). U. S. east of Rocky Mts., south to Argentina. Host: *Trypargilum politum* (Say).

*Pyria tridens* Lepeletier, 1825. In Olivier, Encycl. Meth., Dict. Ins., v. 10, p. 495. ♀.

*Chrysis truncata* Guerin, 1842. Rev. Zool., p. 146. ♂, ♀.

*Chrysis Mexicana* Guerin, 1842. Rev. Zool., p. 147.

*Chrysis tridentata* Dahlbom, 1845. Dispos. Method. Spec. Hym., pt. 2, p. 13.

*Chrysis unicolor* Brulle, 1846. Hist. Nat. Ins. Hym., v. 4, p. 42. ♀. Preocc.

*Chrysis olivieri* Brulle, 1846. Hist. Nat. Ins. Hym., v. 4, p. 43. ♀. Type locality erroneous. N. syn. (R. M. Bohart).

*Chrysis virens* Cresson, 1865. Ent. Soc. Phila. Proc. 4: 309. ♀. Preocc.

*Chrysis Brullei* Abeille de Perrin, 1879. Soc. Linn. Lyon, Ann. 26: 42. N. name for unicolor Br.

Taxonomy: Bohart, 1966. Biol. Soc. Wash., Proc. 79: 132.

Biology: Johnson, 1974. Ent. Soc. Wash., Proc. 76: 448-449 (host).

### Genus STILBUM Spinola

*Stilbum* Spinola, 1806. Insectorum Liguria, v. 1, p. 9.

Type-species: *Stilbum calens* Spinola. Desig. by Latreille, 1810 (= *Chrysis cyanura* Foerster).

This genus is not an established member of the Nearctic fauna. A specimen from Ontario in the Provancher collection is either mislabeled or is a stray which did not become established.

**cyanurum** var. **amethystinum** (Fabricius). One specimen from Ont., but not established;

Mediterranean area, Asia, East Indies.

*Chrysis amethystina* Fabricius, 1775. *Systema Ent.*, p. 359.

*Stilbum splendidulum* Westwood, 1842. In Donovan, *Epitome Nat. Hist. Ins. India*, p. 88.

#### SUBFAMILY PARNOPINAE

#### Genus PARNOPES Latreille

*Parnopes* Latreille, 1796. *Precis. Caract. Gen. Ins.*, p. 126. No species — Latreille, 1802.

*Hist. Nat. Crust. Ins.*, v. 3, p. 317.

Type-species: *Chrysis grandior* Pallas. First included species (= *Chrysis carnea* Fabricius).

Species of *Parnopes* are parasitic on ground-nesting sphecoid wasps belonging to the Bembicini. The egg of *Parnopes* is deposited during provisioning of the nest by the host wasp, but the *Parnopes* larva does not develop until the host larva has spun its cocoon.

Revision: Viereck, 1904. *Amer. Ent. Soc., Trans.* 30: 245-250. — Telford, 1964. *Univ. Calif. Pubs. Ent.* 36: 1-42, 5 pls., 1 text fig.

**borregoensis** Telford. Southern Calif.; Mexico (Baja California).

*Parnopes borregoensis* Telford, 1964. *Univ. Calif. Pubs. Ent.* 36: 9, pl. 1, fig. 2. ♂, ♀.

**chrysoprasinus** Smith. N. Y. south to Fla., west to Wis. and Tex. Host: *Bembix nubilipennis* Cr.; *B. americana spinolae* Lep.?, *Steniolia obliqua* (Cr.)?.

*Parnopes chrysoprasinus* Smith, 1874. *Ent. Soc. London, Trans.* p. 454, n. 8. ♂.

*Parnopes aglaspidula* Melander and Brues, 1902. *Biol. Bul.* 3: 38. ♀.

Biology: Evans, 1966. *Compar. ethology and evolution of sand wasps*, pp. 307-308, 314-315 (life history).

**concinus** Viereck. Calif. to western Tex., Nev.; Mexico (Baja California, Jalisco). Host:

*Bembix multipicta* Sm.?; *Glenostictia scitula* (Fox)?; *Steniolia duplicata* Prov.?

*Parnopes concinna* Viereck, 1904. *Amer. Ent. Soc., Trans.* 30: 248. ♀.

*Parnopes arizonensis* Viereck, 1904. *Amer. Ent. Soc., Trans.* 30: 249. ♂, ♀.

*Parnopes digueti* du Buysson, 1904. *Rev. d'Ent. Caen* 23: 274. ♂.

Biology: Evans, 1966. *Compar. ethology and evolution of sand wasps*, pp. 205, 344.

**edwardsii** (Cresson). Alaska to California, east to the Rocky Mts.; Mexico (Baja California).

Host: *Bembix amoena* Handl.?; *B. americana comata* Prkr.; *B. americana spinolae* Lep.?; *B. pruinosa* Fox.?; *Steniolia obliqua* (Cr.).

*Euchroeus Edwardsii* Cresson, 1879. *Amer. Ent. Soc., Trans.* 7: Proc., p. iv. ♀.

*Parnopes boutheryi* Brethes, 1902. *Mus. Nac. Buenos Aires, An.* 8 (3): 287. ♀, ♂.

*Parnopes hageni* Viereck, 1904. *Amer. Ent. Soc., Trans.* 30: 246. ♂, ♀.

*Parnopes henshawii* Viereck, 1904. *Amer. Ent. Soc., Trans.* 30: 247. ♀.

Biology: Bohart and MacSwain, 1940. *Pan-Pacific Ent.* 16: 92-93. — Evans and Gillaspay, 1964.

*Amer. Midland Nat.* 72: 277, fig. 14. — Evans, 1966. *Compar. ethology and evolution of sand wasps*, pp. 219, 288, 315, 349.

Morphology: Snodgrass, 1941. *Smithsn. Inst., Misc. Collect.* 99, no. 14, pp. 42-43, pl. 13, figs. P, R (male genitalia).

**excurvatus** Viereck. B. C., Calif., Nev., Ariz.

*Parnopes excurvata* Viereck, 1904. *Amer. Ent. Soc., Trans.* 30: 250. "♀" = ♂.

**festivus** Cockerell. Colo., Ariz. to western Tex.; Mexico (Chihuahua).

*Parnopes festivus* Cockerell, 1894. *Ent. News* 5: 328. ♀.

**fulvicornis atlanticus** Krombein. Md., Va., N. C., ? Fla. Host: *Microbembex monodonta* (Say)?

*Parnopes westcottii atlanticus* Krombein, 1958. *Amer. Ent. Soc., Trans.* 84: 164. ♀, ♂.

Biology: Krombein, 1958. *Amer. Ent. Soc., Trans.* 84: 166-167.

**fulvicornis fulvicornis** Cameron. Idaho and Iowa south to Calif. and Tex., and further south to Guatemala. Host: *Microbembex nigrifrons* (Prov.); *M. monodonta* (Say)?

*Parnopes fulvicornis* Cameron, 1888. Biol. Cent.-Amer. Hym., v. 1, p. 466, pl. 20, figs. 1, 1a. ♀.

*Parnopes westcottii* Melander and Brues, 1902. Biol. Bul. 3: 39. ♂, ♀.

*Parnopes diadema* Viereck, 1904. Amer. Ent. Soc., Trans. 30: 248. ♂, ♀.

*Parnopes taeniata* Viereck, 1904. Amer. Ent. Soc., Trans. 30: 249. ♀.

Biology: Bohart and MacSwain, 1940. Pan-Pacific Ent. 16: 92-93 (host record for *nigrifrons* misdet. as *aurata*). —Evans, 1966. Compar. ethology and evolution of sand wasps, pp. 387-388.

## Family DRYINIDAE

The North American fauna is very poorly known and probably a large number of taxa remain to be collected and described. Except in the Aphelopinae the sexes are strongly dimorphic and difficult to associate except by rearing. Males appear to be extremely rare or lacking in many species. Classification of the family is based entirely on characters of the females.

These small wasps parasitize nymphs of Homoptera, principally species belonging to the Fulgoridae, Cercopidae, Membracidae and Cicadellidae. The wasp larvae develop endoparasitically in the host abdomen. In the later stages of development the parasite protrudes from the host abdomen as a cyst, formed from the moulted skins of the parasite in the Anteoninae, Dryininae and Gonatopodinae, but from the host tissues in the Aphelopinae. Pupation takes place in a cocoon spun on the host's food plant or in the soil.

Taxonomy: Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 80-102. —Kieffer, 1914. Das Tierreich, Lief. 41, pp. 7-222. —Richards, 1939. Roy. Ent. Soc. London, Trans. 89: 188-293 (British species). —Richards, 1953. Roy. Ent. Soc. London, Trans. 104: 51-70 (keys to some genera of Anteoninae and Dryininae). —Ponamarenko, 1970. Rev. d'Ent. de l'USSR 49: 423-427 (family reclassification; English translation, 1971. Ent. Rev. 49: 254-256).

Biology: Perkins, 1905. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 1(1): 6-20. —Haupt, 1916. Ztschr. f. Wiss. Insektenbiol. 12: 217-223. —Fenton, 1918. Ohio Jour. Sci. 18: 182-257.

Morphology: Swezey, 1903. Ohio Naturalist 3: 448-451. —Haupt, 1932. Zool. Anz. 99: 1-18. —Reid, 1941. Roy. Ent. Soc. London, Trans. 91: 409-412, figs. 47-50 (female, male thorax).

### SUBFAMILY ANTEONINAE

#### Genus ANTEON Jurine

#### Genus ANTEON Subgenus ANTEON Jurine

*Anteon* Jurine, 1807. Nouv. Meth. Class. Hym. Dipt., p. 302.

Type-species: *Anteon jurineanus* Latreille. First included species.

*Antaeon* Haliday, 1833. Ent. Mag. 1: 275. Emend.

*Prosanteton* Perkins, 1905. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 1: 66.

Type-species: *Prosanteton chelognoides* Perkins. Orig. desig.

*Liodryinus* Kieffer, 1913. Lab. Zool. Gen. e Agr. Portici, Bol. 7: 325.

Type-species: *Anteon doddi* Kieffer. Orig. desig.

*Xenanteton* Kieffer, 1913. Soc. Ent. France, Bul., p. 300.

Type-species: *Xenanteton reticulatus* Kieffer. Desig. by Muesebeck and Walkley, 1951.

*Allanteton* Kieffer, 1914. Das Tierreich, Lief. 41, p. 198.

Type-species: *Anteon punctatus* Kieffer. Monotypic.

*arizonensis* Perkins. Ariz. (Nogales). Host: Cicadellidae nymph.

*Anteon arizonensis* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 51. ♂, ♀.

*canadensis* (Ashmead). Que., Ont., Md.

*Chelognus canadensis* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 93. ♀.

**hirtifrons** Whittaker. B. C. (Hollyburn).

*Anteon hirtifrons* Whittaker, 1930. Ent. Soc. Wash., Proc. 32: 68. ♂.

**minutus** Ashmead. D. C.

*Anteon minutus* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 97. ♀.

**pallidicornis** Ashmead. Utah (Utah Lake).

*Anteon pallidicornis* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 97. ♀.

**politus** Ashmead. Que., Ont.

*Anteon politus* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 96. ♀.

**popenoei** (Ashmead). Kans. Assigned questionably to *Anteon*.

*Dryinus popenoei* Ashmead, 1888. Kans. State Col. Agr., Bul. 3: App., p. I. ♂.

**puncticeps** Ashmead. D. C., Va.

*Anteon puncticeps* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 97. ♂.

**rugosiceps** Kieffer. Calif. (Santa Clara).

*Anteon rugosiceps* Kieffer, 1906. Berlin. Ent. Ztschr. 50: 238. ♂.

**tibialis** Say. D. C., Ind. Assigned questionably to *Anteon*.

*Anteon tibialis* Say, 1836. Boston Jour. Nat. Hist. 1: 284. ♂.

**unifasciatus** Ashmead. Fla. (Biscayne Bay).

*Anteon unifasciatus* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 95. ♀.

**whittakeri** Muesebeck and Walkley. B. C.

*Anteon flaviscapus* Whittaker, 1930. Ent. Soc. Wash., Proc. 32: 67. ♂. Preocc.

*Anteon whittakeri* Muesebeck and Walkley, 1951. U. S. Dept. Agr., Monog. 2: 1040. N. name.

#### Genus ANTEON Subgenus CHELOGYNUS Haliday

*Chelogyne* Haliday, 1838. Ent. Mag. 5: 518.

Type-species: *Dryinus infectus* Haliday. Desig. by Muesebeck and Walkley, 1951.

*Neochelogyne* Perkins, 1905. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 1: 60.

Type-species: *Neochelogyne typicus* Perkins. Orig. desig.

*Lasianteon* Kieffer, 1913. Soc. Ent. France, Bul. p. 200.

Type-species: *Anteon rubrifrons* Kieffer. Desig. by Muesebeck and Walkley, 1951.

*Callianteon* Kieffer, 1913. Soc. Ent. France, Bul., p. 300.

Type-species: *Anteon bifasciatus* Kieffer. Monotypic.

**funestus** Perkins. Ariz. Host: Cicadellidae nymph.

*Chelogyne funestus* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 48. ♀, ♂.

**lusus** Perkins. Ariz. (Tucson). Host: Cicadellidae nymph.

*Chelogyne lusus* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 50. ♀.

**melanacrias** Perkins. Ariz. (Nogales).

*Chelogyne melanacrias* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 49. ♀.

**minimus** Fenton. N. Y. (Barneveld).

*Chelogyne minimus* Fenton, 1927. U. S. Natl. Mus., Proc. 72 (8): 13. ♀.

**osborni** Fenton. Ohio (Sandusky). Host: *Chlorotettix unicolor* (Fitch).

*Chelogyne osborni* Fenton, 1918. Ohio Jour. Sci. 18: 256, 272. ♀.

**rugulosus** Fenton. N. B. (Saint John).

*Chelogyne rugulosus* Fenton, 1927. U. S. Natl. Mus., Proc. 72 (8): 14. ♀.

**virginiensis** Fenton. Va. (Rosslyn).

*Chelogyne virginiensis* Fenton, 1927. U. S. Natl. Mus., Proc. 72 (8): 14. ♀.

**vivariensis** Bradley. N. Y., R. I.

*Chelogyne vivariensis* Bradley, 1926. Biol. Soc. Wash., Proc. 39: 7. ♀.

**xanthothorax** Bradley. N. Y.

*Chelogyne xanthothorax* Bradley, 1926. Biol. Soc. Wash., Proc. 39: 8. ♀.

Genus **DEINODRYINUS** Perkins

*Deinodryinus* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 45.

Type-species: *Deinodryinus paradoxus* Perkins. Desig. by Muesebeck and Walkley, 1951.

*atriceps* (Brues). N. Y., Pa., Va., W. Va., Iowa, Kans.

*Bocchus atriceps* Brues, 1904. Canad. Ent. 36: 118. ♀.

*Deinodryinus variabilis* var. *carinatus* Fenton, 1927. U. S. Natl. Mus., Proc. 72 (8): 11. ♀.

*atriventris* (Cresson). Tex.

*Dryinus atriventris* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 193. ♀.

*ferrugineus* (Brues). Tex.

*Chelogyne ferrugineus* Brues, 1905. Wis. Nat. Hist. Soc., Bul. 3: 183. ♀.

*grandis* (Brues). Mass., N. Y., W. Va.

*Chelogyne grandis* Brues, 1905. Wis. Nat. Hist. Soc., Bul. 3: 184. ♀.

*henshawi* (Ashmead). Mass. N. Y., Wis., Nebr.

*Chelogyne Henshawi* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 93. ♀.

*paradoxus* Perkins. Ariz. (Nogales). Host: *Cicadellidae* sp. on oak.

*Deinodryinus paradoxus* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 46. ♀, ♂.

*pilosus* Fenton. Ariz. (Chiricahua Mts.).

*Deinodryinus pilosus* Fenton, 1927. U. S. Natl. Mus., Proc. 72 (8): 12. ♀.

*quercicola* Perkins. Ariz. (Nogales).

*Deinodryinus quercicola* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 47. ♀.

*schaefferi* (Brues). Ariz., Tex.

*Chelogyne schaefferi* Brues, 1907. Wis. Nat. Hist. Soc., Bul. 5: 101. ♀.

*variabilis* Fenton. Va. (Falls Church).

*Deinodryinus variabilis* Fenton, 1927. U. S. Natl. Mus., Proc. 72 (8): 10. ♀.

Genus **PRENANTEON** Kieffer

*Prenanteon* Kieffer, 1913. Soc. Ent. France, Bul. p. 301.

Type-species: *Anteon crassiscapus* Kieffer. Desig. by Kieffer, 1914.

*americanus* Kieffer. Wis.

*Prenanteon americanum* Kieffer, 1914. Soc. Ent. France, Bul. p. 91.

*bakeri* (Kieffer). Nev. (Ormsby Co.).

*Anteon bakeri* Kieffer, 1906. Berlin. Ent. Ztschr. 50: 239. ♀.

*micropunctatus* Fenton. N. B. (Nerepis).

*Prenanteon micropunctatus* Fenton, 1927. U. S. Natl. Mus., Proc. 72 (8): 15. ♀.

Genus **TRISANTEON** Kieffer

*Trisanteon* Kieffer, 1913. Soc. Ent. France, Bul. p. 300.

Type-species: *Anteon hirticornis* Kieffer. Monotypic.

*rugosus* (Ashmead). Ill.

*Anteon rugosus* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 96. ♂.

Genus **HESPERODRYINUS** Perkins

*Hesperodryinus* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 40.

Type-species: *Hesperodryinus arizonicus* Perkins. Orig. desig.

*amphiscepe* Perkins. Ariz. (Nogales). Host: *Acanalonia bivittata* (Say) nymph.

*Hesperodryinus amphiscepe* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 41. ♀.

- arizonicus** Perkins. Ariz. (Nogales). Host: *Mistharnophantia sonorana* Kirk. nymph.  
*Hesperodryinus arizonicus* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 42. ♀.
- audax** Perkins. Ariz. (Nogales).  
*Hesperodryinus audax* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 43. ♀.

### Genus BOCCHUS Ashmead

- Bocchus* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 91.  
 Type-species: *Bocchus flavicollis* Ashmead. Orig. desig.
- Phorbas* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 90. Preocc.  
 Type-species: *Phorbas laticeps* Ashmead. Monotypic.
- Eukoebeleia* Perkins, 1905. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 1: 59.  
 Type-species: *Eukoebeleia mirabilis* Perkins. Orig. desig.
- Phorbasia* Kieffer, 1914. Das Tierreich, Lief. 41, p. 58. N. name.
- Neoanteon* Fouts, 1922. Philippine Jour. Sci. 20: 633.  
 Type-species: *Neoanteon rubrica* Fouts. Orig. desig.
- Taxonomy: Fenton, 1918. Ohio Jour. Sci. 18: 261 (key to spp.).
- arizonica** (Perkins). Ariz. (Nogales). Host: *Bruchomorpha* sp.?  
*Eukoebeleia arizonica* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 44. ♀.
- flavicollis** Ashmead. Mich. (Marquette).  
*Bocchus flavicollis* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 91. ♀.
- laticeps** (Ashmead). Fla.  
*Phorbas laticeps* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 90. ♂.
- mirabilis** (Perkins). Ohio. Host: *Bruchomorpha oculata* Newm.  
*Eukoebeleia mirabilis* Perkins, 1905. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 1: 59. ♀.

### SUBFAMILY DRYININAE

#### Genus MESODRYINUS Kieffer

- Mesodryinus* Kieffer, 1906. In Andre, Spec. Hym. Eur. Alg., v. 9, p. 497.  
 Type-species: *Dryinus niger* Kieffer. Orig. desig.
- alatus** (Cresson). Tex.  
*Gonatopus* (?) *alatus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 193. ♀.
- americanus** (Ashmead). Fla.  
*Mystrophorus americanus* Ashmead, 1887. Ent. Amer. 3: 128. ♀.
- crawfordi** Krombein. Md. (Plummers Island).  
*Mesodryinus crawfordi* Krombein, 1962. Biol. Soc. Wash., Proc. 75: 3. ♀.

#### Genus TETRADRYINUS Kieffer

- Tetradryinus* Kieffer, 1913. Lab. Zool. Gen. e Agr. Portici, Bol. 7: 325.  
 Type-species: *Bocchus flavipes* Kieffer. Monotypic.
- flavipes** (Kieffer). Nev. (Ormsby Co.).  
*Bocchus flavipes* Kieffer, 1906. Berlin. Ent. Ztschr. 50: 237. ♀.

#### Genus THAUMATODRYINUS Perkins

- Thaumatomydrius* Perkins, 1905. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 1 (1): 58.  
 Type-species: *Thaumatomydrius koebelei* Perkins. Orig. desig.
- Taxonomy: Krombein, 1952. Amer. Ent. Soc., Trans. 78: 97-99, 1 pl. (revis. gen. diag. and key to spp.)

*perkinsi* Krombein. Va. (Westmoreland St. Pk.).

*Thaumatomydrius perkinsi* Krombein, 1952. Amer. Ent. Soc., Trans. 78: 99, figs. 2, 2a, 2b.  
♀.

### Genus PERODRYINUS Perkins

*Perodryinus* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 43.

Type-species: *Perodryinus amoenus* Perkins. Monotypic.

*amoenus* Perkins. Ariz. (Nogales). Host: *Acanalonia bivittata* (Say) nymph.

*Perodryinus amoenus* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 43. ♀, ♂.

### SUBFAMILY GONATOPODINAE

### Genus NEODRYINUS Perkins

#### Genus NEODRYINUS Subgenus NEODRYINUS Perkins

*Neodryinus* Perkins, 1905. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 1 (1): 50.

Type-species: *Neodryinus koebelei* Perkins. Orig. desig.

*Prodryinus* subg. *Ctenodryinus* Arle, 1935. Rio de Janeiro, Mus. Nac., Bol. 11: 46.

Type-species: *Prodryinus* (*Ctenodryinus*) *affinis* Arle. Monotypic.

The typical subgenus does not occur in North America.

#### Genus NEODRYINUS Subgenus PRODRYINUS Kieffer

*Neodryinus* subg. *Psilodryinus* Kieffer, 1906. In Andre, Spec. Hym., Eur. Alg., v. 9, p. 497.

Type-species: *Dryinus acuticollis* Kieffer. Orig. desig.

*Prodryinus* Kieffer, 1906. In Andre, Spec. Hym. Eur. Alg., v. 9, p. 497.

Type-species: *Dryinus brachycerus* Kieffer. Orig. desig.

*Phanerodryinus* Roepke, 1916. Tijdschr. v. Ent. 59: 289.

Type-species: *Phanerodryinus javanus* Roepke. Orig. desig.

*Psilodryinus* has line priority over *Prodryinus*, but Richards (1953), the first reviser, placed the former as a synonym of the latter.

*arizonicus* Perkins. Ariz. (Nogales). Host: *Ormenis septentrionalis* (Spin.) nymph.

*Neodryinus arizonicus* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 38. ♀.

*carinatus* (Fouts). Pa. (Carlisle).

*Psilodryinus carinatus* Fouts, 1924. Ent. Soc. Wash., Proc. 26: 160. ♀.

*dubiosus* Perkins. Ariz. (Nogales).

*Neodryinus dubiosus* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 39. ♀.

*typhlocybae* (Ashmead). N. Y., D. C., Ohio, Ill., Iowa, Ark., Kans., Tex. Host: *Metcalfa pruinosa* (Say), *Anormenis septentrionalis* (Spin.).

*Labeo typhlocybae* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 89. ♂.

*Dryinus ormenidis* Ashmead, 1903. Ent. News 14: 192. ♀.

*Dryinus nigrellus* Brues, 1904. Canad. Ent. 36: 117. ♀.

Biology: Dean and Bailey, 1961. Jour. Econ. Ent. 54: 1104-1106, 2 figs.

### Genus CYRTOGONATOPUS Kieffer

*Pachygonatopus* subg. *Cyrtogonatopus* Kieffer, 1907. In Wytsman, Gen. Ins., fasc. 54, p. 19.

Type-species: *Pachygonatopus* (*Cyrtogonatopus*) *breviforceps* (Kieffer). Monotypic.

Taxonomy: Richards, 1969. Roy. Ent. Soc. London, Proc. (B) 38: 80 (genus redescription).

*clavicornis* Fenton. Tex. (Brownsville).

*Cyrtogonatopus clavicornis* Fenton, 1927. U. S. Natl. Mus., Proc. 72(8): 3.



## Genus PRISTOGONATOPUS Kieffer

*Pristogonatopus* Kieffer, 1913. Lab. Zool. Gen. e. Agr. Portici, Bol. 7: 325.

Type-species: *Gonatopus dentatiforceps* Kieffer. Orig. desig.

**sjostedti** (Kieffer). Tex.

*Gonatopus sjostedti* Kieffer, 1904. Arkiv. for Zool. 1: 525. ♀.

## Genus DICONDYLLUS Haliday

*Dicondylus* Haliday, 1829-30. In Curtis, Guide Brit. Ins., col. 110.

Type-species: *Dryinus bicolor* Haliday. Desig. by Kieffer, 1914.

*Labeo* Haliday, 1833. Ent. Mag. 1: 273. Preoc.

Type-species: *Labeo vitripennis* Haliday. Monotypic.

*Labeola* Haldeman, 1842. Acad. Nat. Sci. Phila., Proc. 1: 192. N. name.

*Laberius* Kieffer, 1914. Das Tierreich, Lief. 41, p. 59. N. name.

*Laberinus* (!) Ogloblin, 1932. Rev. de Ent. Sao Paulo 2: 266. Misspelling.

**albitarsis** (Kieffer). Nev.

*Labeo albitarsis* Kieffer, 1906. Berlin. Ent. Ztschr. 50: 2.

**nasutus** (Ashmead). Fla. (Jacksonville).

*Embolemus nasutus* Ashmead, 1887. Ent. Amer. 3: 75. ♂.

**texanus** (Ashmead). Tex. Assigned questionably to *Dicondylus*.

*Labeo texanus* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 89. ♂.

## Genus PSEUDOGONATOPUS Perkins

*Pseudogonatopus* Perkins, 1905. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 1: 34.

Type-species: *Pseudogonatopus kurandae* Perkins. Orig. desig.

**americanus** Perkins. Ohio (Columbus).

*Pseudogonatopus americanus* Perkins, 1905. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 1: 37. ♀.

**arizonicus** Perkins. Ariz. (Nogales). Host: *Stobaera*? sp., nymph and adult.

*Pseudogonatopus arizonicus* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 36. ♀.

**autoxenobius** Perkins. Ariz. (Nogales). Host: *Stobaera*? sp. adult.

*Pseudogonatopus autoxenobius* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 37. ♀.

**iowensis** Fenton. Iowa. Host: *Delphacodes tutulenta* (Van D.).

*Pseudogonatopus iowensis* Fenton, 1924. Ohio Jour. Sci. 24: 191. ♀.

**magnus** Brown. Ind. (Wawasee Lake).

*Pseudogonatopus magnus* Brown, 1940. Ent. News. 51: 11. ♀.

**stenocrani dubiosus** Perkins. Ohio.

*Pseudogonatopus stenocrani* var. *dubiosus* Perkins, 1905. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 1: 39. ♀.

**stenocrani stenocrani** Perkins. Ohio.

*Pseudogonatopus stenocrani* Perkins, 1905. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 1: 38. ♀.

## Genus AGONATOPOIDES Perkins

*Agonatopoides* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 33.

Type-species: *Agonatopoides synchronus* Perkins. Monotypic.

**synchronus** Perkins. Ariz. (Nogales). Host: *Bostaera nasuta* Ball, nymph and adult.

*Agonatopoides synchronus* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 33.

## Genus HAPLOGONATOPUS Perkins

*Haplogonatopus* Perkins, 1905. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 1: 39.

Type-species: *Haplogonatopus apicalis* perkins. Orig. desig.  
*americanus* Perkins. Va., Ohio, Iowa. Host: *Delphacodes campestris* (Van D.); *D. luteola* (Van D.).

*Haplogonatopus americanus* Perkins, 1905. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 1: 40. ♀.

## Genus EUCAMPTONYX Perkins

*Eucamptonyx* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 28.

Type-species: *Eucamptonyx testaceus* Perkins. Monotypic.  
*secundus* Fenton. Ohio, Fla., Md., Kans.

*Eucamptonyx secundus* Fenton, 1927. U. S. Natl. Mus., Proc. 72 (8): 5. ♀.

*testaceus* Perkins. Ariz. (Nogales).

*Eucamptonyx testaceus* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 28. ♀.

## Genus APTERODRYINUS Perkins

*Apterodryinus* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 14.

Type-species: *Apterodryinus torvus* Perkins. Monotypic.  
*torvus* Perkins. Ariz. (Nogales). Host: *Mistharnophantia sonorana* Kirk.; *Acanalonia immaculata* (Kirk.).

*Apterodryinus torvus* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 14. ♀.

## Genus PACHYGONATOPUS Perkins

*Pachygonatopus* Perkins, 1905. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 1: 45.

Type-species: *Pachygonatopus melanias* Perkins. Orig. desig.  
*minimus* Fenton. S. Dak., Man. Host: *Macrosteles fascifrons* (Stal).

*Pachygonatopus minimus* Fenton, 1927. U. S. Natl. Mus., Proc. 72 (8): 6. ♀.

Taxonomy: Barrett, Westdal and Richardson, 1965. Canad. Ent. 97: 217-219, figs. 1-10 (egg, larvae, pupa, adults).

Biology: Barrett, Westdal and Richardson, 1965. Canad. Ent. 97: 219-221 (life history).  
*nearcticus* Fenton. Iowa (Sioux City).

*Pachygonatopus nearcticus* Fenton, 1927. U. S. Natl. Mus., Proc. 72 (8): 6. ♀.

## Genus CHALCOGONATOPUS Perkins

*Chalcogonatopus* Perkins, 1905. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 1: 46.

Type-species: *Chalcogonatopus gigas* Perkins. Orig. desig.  
*Chalcogonatopus* subg. *Eugonatopus* Perkins, 1905. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 1: 46.

Type-species: *Chalcogonatopus (Eugonatopus) pseudochromus* Perkins. Monotypic.  
*areolatus* Fenton. Va. (Falls Church).

*Chalcogonatopus areolatus* Fenton, 1927. U. S. Natl. Mus., Proc. 72 (8): 7. ♀.

*argyrius* Perkins. Ariz. (Nogales).

*Chalcogonatopus argyrius* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 20. ♀.

*californicus* (Ashmead). Calif.

*Gonatopus californicus* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 85. ♀.

**echo** Perkins. Ariz. (Nogales).

*Chalcogonatopus echo* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 23. ♀.

**euprepes** Perkins. Ariz. (Nogales).

*Chalcogonatopus euprepes* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 18. ♀.

*Chalcogonatopus euprepes* var. *a* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 19. ♀.

*Chalcogonatopus euprepes* (!) Kieffer, 1914. Das Tierreich, Lief. 41, p. 99.

**euprepoides** Perkins. Ariz. (Nogales).

*Chalcogonatopus euprepoides* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 19. ♀.

*Chalcogonatopus euprepoides* (!) Kieffer, 1914. Das Tierreich, Lief. 41, p. 99.

**flavifrons** (Ashmead). N. Y. (Albany).

*Gonatopus flavifrons* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 84, pl. 5, fig. 4. ♀.

**frequens** Perkins. Ariz. (Nogales).

*Chalcogonatopus frequens* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 21. ♀.

**harpax** Krombein. W. Va. (Lost River St. Pk.).

*Chalcogonatopus harpax* Krombein, 1956. Ent. Soc. Wash., Proc. 58: 158, fig. 1. ♀.

**herbarum** Perkins. Ariz. (Nogales).

*Chalcogonatopus herbarum* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 23. ♀.

**koebeleri** Perkins. Ariz. (Nogales).

*Chalcogonatopus koebeleri* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 26. ♀.

**leptias** Perkins. Ariz. (Nogales).

*Chalcogonatopus leptias* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 17. ♀.

**niger** Fenton. Iowa. Host: *Scaphoideus* sp., probably *immistus* Say.

*Chalcogonatopus nigrus* Fenton, 1924. Ohio Jour. Sci. 24: 193, fig. 3. ♀.

**paralectias** Perkins. Ariz. (Nogales).

*Chalcogonatopus paralectias* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 18. ♀.

**perdebilis** Perkins. Ariz. (Nogales).

*Chalcogonatopus perdebilis* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 27. ♀.

**pseudochromus** Perkins. Ohio (Columbus).

*Chalcogonatopus (Eugonatopus) pseudochromus* Perkins, 1905. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 1: 48. ♀.

**rapax** Perkins. Ariz. (Nogales). Host: Cicadellidae nymph on willow.

*Chalcogonatopus rapax* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 20. ♀.

**simulator** Perkins. Ariz. (Nogales).

*Chalcogonatopus simulator* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 26. ♀.

**solitarius** Perkins. Ariz. (Nogales).

*Chalcogonatopus solitarius* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 22. ♀.

**unicus** Perkins. Ariz. (Nogales).

*Chalcogonatopus unicus* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 25. ♀.

**xestocephalus** Perkins. Ariz. (Nogales).

*Chalcogonatopus xestocephalus* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 24. ♀.

## Genus GONATOPUS Ljungh

*Gonatopus* Ljungh, 1810. Beitr. Naturk., v. 2, p. 161.

Type-species: *Gonatopus formicarius* Ljungh. Monotypic.

Revision: Richards, 1939. Roy. Ent. Soc. London, Trans. 89: 185-344 (European spp.).

Taxonomy: Fenton, 1918. Ohio Jour. Sci. 18: 265-266 (key to spp.).

Biology: Haupt, 1916. Ent. Gesell. Halle, Mitt. 10: 41-50.

Morphology: Haupt, 1932. Zool. Anz. 99: 1-18.

**affinis** Fenton. Ohio (Bay View). Host: *Psammotettix affinis* (G. and B.).

*Gonatopus affinis* Fenton, 1918. Ohio Jour. Sci. 18: 266. ♀, ♂.

**agropyryus** Fenton. Iowa (Ames). Host: *Psammotettix affinis* (G. and B.).

*Gonatopus agropyryus* Fenton, 1921. Canad. Ent. 58: 71. ♀, ♂.

**ashmeadi** Kieffer. Ala., Fla., Tex. Host: *Delphacodes luteolenta* (Van D.)?

*Gonatopus bicolor* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 85. ♀. Preocc.

*Gonatopus ashmeadi* Kieffer, 1904. In Andre, Spec. Hym. Eur. Alg., v. 9, p. 108. N. name.

**contortulus** Patton. Que., Mass., Conn., Ohio. Host: *Latalus sayi* (Fitch).

*Gonatopus contortulus* Patton, 1879. Canad. Ent. 11: 65. ♀.

**curriei** Krombein. Md. (Plummers Island).

*Gonatopus curriei* Krombein, 1962. Biol. Soc. Wash., Proc. 75: 4. ♀.

**cyphonotus** Bradley. B. C. (Downie Creek, Big Bend Country).

*Gonatopus cyphonotus* Bradley, 1906. Canad. Ent. 38: 380. ♀.

**foutsii** Whittaker. B. C. (Chilliwack).

*Gonatopus foutsii* Whittaker, 1928. Ent. Soc. London, Trans. p. 388. ♀.

**inimicus** Fenton. Ohio. Host: *Endria inimica* (Say).

*Gonatopus inimicus* Fenton, 1918. Ohio Jour. Sci. 18: 270. ♀.

**longicornis** (Brues). Pa. (Saegerstown). Questionably assigned to *Gonatopus*.

*Phorbas longicornis* Brues, 1907. Wis. Nat. Hist. Soc., Bul. 5: 152. ♂.

**peculiaris** Brues. Tex. (Austin).

*Gonatopus peculiaris* Brues, 1903. Amer. Ent. Soc., Trans. 29: 125. ♀.

**punctatus** Fenton. Ohio (Columbus). Host: *Latalus sayi* (Fitch).

*Gonatopus punctatus* Fenton, 1918. Ohio Jour. Sci. 18: 268. ♂, ♀.

**septentrionalis** Whittaker. B. C. (Chilliwack).

*Gonatopus septentrionalis* Whittaker, 1928. Ent. Soc. London, Trans. p. 388. ♀.

**similis** Fenton. Iowa (Ames). Host: *Psammotettix affinis* (G. and B.).

*Gonatopus similis* Fenton, 1921. Canad. Ent. 53: 71. ♀.

## Genus NEOGONATOPUS Perkins

*Neogonatopus* Perkins, 1905. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 1: 42.

Type-species: *Neogonatopus ombrodes* Perkins. Orig. desig.

*Allogonatopus* Haupt, 1938. Ztschr. f. Naturw. 92: 21.

Type-species: *Allogonatopus procerus* Haupt. Orig. desig.

Taxonomy: Fenton, 1918. Ohio Jour. Sci. 18: 265-266 (key to spp.).

**brunnescens** Perkins. Ohio.

*Neogonatopus brunnescens* Perkins, 1905. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 1: 44. ♀.

**erythrodes** Perkins. Ohio, Iowa. Host: *Endria inimica* (Say).

*Neogonatopus erythrodes* Perkins, 1905. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 1: 43. ♀.

**longitarsis** (Ashmead). Fla., La.

*Labeo longitarsis* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 88. ♂.

**mimoides** Perkins. Ariz., Utah.

*Neogonatopus mimoides* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 34. ♀.

**mimus** Perkins. Ariz. (Nogales). Host: Cicadellidae.

*Neogonatopus mimus* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 33. ♀.

**obscurissimus** Perkins. Ohio (Columbus). Host: *Deltocephalus* spp.

*Neogonatopus obscurissimus* Perkins, 1905. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 1: 43. ♀.

**ombrodes** Perkins. Ohio, Colo., Calif., Conn., S. Dak. Host: *Macrostes divinus* (Uhl.).

*Neogonatopus ombrodes* Perkins, 1905. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 1: 43. ♀.

Biology: Ainslie, 1920. Ent. News 31: 169, 187.

**pallidiceps** Perkins. Calif. (Alameda).

*Neogonatopus pallidiceps* Perkins, 1905. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 1: 45. ♀.

**Genus AGONATOPUS** Perkins

*Agonatopus* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 29.  
Type-species: *Agonatopus pallidicornis* Perkins. Desig. by Richards, 1939.

**dubiosus** Perkins. Ariz. (Nogales).

*Agonatopus pallidicornis* var. *dubiosus* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 30. ♀.

**ferrugineus** Perkins. Ariz. (Nogales).

*Agonatopus ferrugineus* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 30. ♀.

**heterothorax** Perkins. Ariz. (Nogales). Host: Cicadellidae nymph on grass.

*Agonatopus heterothorax* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 32. ♀.

**innitidus** Perkins. Ariz. (Nogales). Host: Cicadellidae nymph on grass.

*Agonatopus innitidus* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 31. ♀.

**pallidicornis** Perkins. Ariz.

*Agonatopus pallidicornis* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 29. ♀.

**picescens** Perkins. Ariz. (Nogales).

*Agonatopus picescens* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 30. ♀.

**suturalis** Fenton. Ariz. (Tucson).

*Agonatopus suturalis* Fenton, 1927. U. S. Natl. Mus., Proc. 72 (8): 9. ♀.

**Genus EPIGONATOPUS** Perkins

*Epigonatopus* Perkins, 1905. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 1: 45.

Type-species: *Epigonatopus solitarius* Perkins. Orig. desig.

**americanus** Fenton. Iowa (Ames).

*Epigonatopus americanus* Fenton, 1921. Canad. Ent. 53: 70. ♀.

**plesuis** Fenton. Ont., S. Dak. Host: *Macrostes fascifrons* (Stal.).

*Epigonatopus plesuis* Fenton, 1927. U. S. Natl. Mus., Proc. 72 (8): 9. ♀.

Biology: George, 1959. Canad. Ent. 91: 256.

**tenuis** Fenton. Ind. (La Fayette).

*Epigonatopus tenuis* Fenton, 1927. U. S. Natl. Mus., Proc. 72 (8): 8. ♀.

## Genus DIGONATOPUS Kieffer

*Digonatopus* Kieffer, 1913. Lab. Zool. Gen. e Agr. Portici, Bol. 7: 325.

Type-species: *Discondylus* (!) *javanus* Perkins. Orig. desig.

**haplothorax** (Perkins). Ariz. (Nogales).

*Gonatopus haplothorax* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 35. ♀.

## SUBFAMILY APHELOPINAE

## Genus APHELOPUS Dalman

*Dryinus* subg. *Aphelopus* Dalman, 1823. Analecta Ent., p. 8.

Type-species: *Aphelopus atratus* (Dalman). Desig. by Westwood, 1840.

Taxonomy: Fenton, 1918. Ohio Jour. Sci. 18: 275 (key to spp.).

Morphology: Haupt, 1932. Zool. Anz. 99: 1-18.

**affinis** Ashmead. Canada.

*Aphelopus affinis* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 102. ♀.

**albopictus** Ashmead. Md., D. C., Va.

*Aphelopus albopictus* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 100. ♀.

**americanus** Ashmead. Fla.

*Aphelopus americanus* Ashmead, 1887. Ent. Amer. 3: 74. ♂.

**arizonicus** Perkins. Ariz. (Nogales). Host: *Dikraneura* sp.

*Aphelopus arizonicus* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 53. ♂, ♀.

**bicolor** Fenton. Iowa, Ark., Del. Host: *Hymetta trifasciata* (Say).

*Aphelopus bicolor* Fenton, 1924. Ohio Jour. Sci. 24: 192. ♀.

**comesi** Fenton. Del., Ohio, Mich., Tenn., Iowa, Ark., La. Host: *Erythroneura* spp.

*Aphelopus comesi* Fenton, 1918. Ohio Jour. Sci. 18: 277. ♂.

**dikraneuri** Fenton. Ohio, Iowa. Host: *Forcipata* sp., prob. *loca* DeL. and C.

*Aphelopus dikraneuri* Fenton, 1918. Ohio Jour. Sci. 18: 276. ♀, ♂.

**microleucus** Perkins. Ariz. (Nogales). Host: *Typhlocyba* sp.

*Aphelopus microleucus* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 55. ♂.

**microtomus** Whittaker. B. C. (Chilliwack).

*Aphelopus microtomus* Whittaker, 1928. Ent. Soc. London, Trans. p. 389. ♀.

**pilicornis** Whittaker. B. C. (Chilliwack).

*Aphelopus pilicornis* Whittaker, 1928. Ent. Soc. London, Trans. p. 389. ♀, ♂.

**pulcherrimus** Perkins. Ariz. (Nogales). Host: *Erythroneura* sp.; *Typhlocyba* sp.?

*Aphelopus pulcherrimus* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 54. ? ♂.

**rufiventris** Ashmead. Fla. (Jacksonville).

*Aphelopus rufiventris* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 100. ♀.

**theliae** Gahan. N. Y. (Cold Spring Harbor, L. I.). Host: *Thelia bimaculata* (F.).

*Aphelopus theliae* Gahan, 1918. Canad. Ent. 50: 151. ♀, ♂.

Biology: Kornhauser, 1919. Jour. Morph. 32: 547-554, figs. 1-4.

**typhlocybae** Muesebeck. N. Y., Md. Host: *Typhlocyba pomaria* McA.; *T. froggatti* Baker (in New Zealand).

*Aphelopus typhlocybae* Muesebeck, 1936. Ent. Soc. Wash., Proc. 37: 167. ♀, ♂.

Biology: Steiner, 1936. Jour. Econ. Ent. 29: 632. — Dumbleton, 1937. Jour. Sci. and Technol. New Zealand 18: 869.

**varicornis** Brues. Mass. (Woods Hole).

*Aphelopus varicornis* Brues, 1906. Wis. Nat. Hist. Soc., Bul. 4: 143. ♀.

*viduus* Perkins. Ariz. (Nogales).

*Aphelopus viduus* Perkins, 1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent., Bul. 4: 54. ♂.

#### UNPLACED TAXA OF DRYINIDAE

*Dryinus bifasciatus* Say, 1828. Contrib. Maclur. Lyc. Phila. 1: 81. ♀. Ind. Possibly *Deinodryinus* Perkins.

### Family EMBOLEMIDAE

#### Genus AMPULICOMORPHA Ashmead

*Ampulicomorpha* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 79.

Type-species: *Ampulicomorpha confusa* Ashmead. Orig. desig.

*confusa* Ashmead. Ont., Md., Va., N. C., Ga., Wis., Mo., Colo., Sask., B. C., Calif. Host: Nymphs of *Epiptera floridæ* (Wlkr.) on rotten pine and oak logs, and *E. pallida* (Say) feeding on fungi under bark.

*Ampulicomorpha confusa* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 80. "♂" = ♀.

Biology: Bridwell, 1958. Ent. Soc. Wash., Proc. 60: 23-26.

#### Genus EMBOLEMUS Westwood

*Embolemus* Westwood, 1833. London and Edinb. Phil. Mag. and Jour. Sci. 2: 444.

Type-species: *Embolemus ruddii* Westwood. Monotypic.

*Myrmecomorphus* Westwood, 1833. Mag. Nat. Hist. 6: 496.

Type-species: *Myrmecomorphus rufescens* Westwood. Monotypic.

*Embolinus* Agassiz, 1846. Nomencl. Zool., Ind. Univ., p. 137. Emend.

*Formila* de Romand, 1846. Soc. Ent. France, Ann. (2) 4: Bul., p. XXXII.

Type-species: *Formila chevrolatii* de Romand. Monotypic.

*Pedinomma* Foerster, 1856. Hym. Stud., v. 2, p. 94. Unnecessarily proposed as a n. name for *Myrmecomorphus* Westwood.

Taxonomy: Richards, 1939. Roy. Ent. Soc. London, Trans. 89: 294.

Morphology: Reid, 1941. Roy. Ent. Soc. London, Trans. 91: 412, figs. 51-52 (female, male thorax).

*nearcticus* (Brues). Mass., N. Y., Va.?

*Pedinomma nearcticum* Brues, 1922. Psyche 29: 7. "♂" = ♀.





## Superfamily SCOLIOIDEA

By KARL V. KROMBEIN

Taxonomy: Ashmead, 1903-1904. *Canad. Ent.* 35: 4-8, 39-46, 95-107, 155-158, 199-205, 303-310, 323-332; 36: 5-9 (keys to genera).

### Family TIPHIIDAE

So far as is known all of the North American taxa are parasites of larvae of fossorial species. In the primitive subfamily Tiphinae, species of *Tiphia* F. have been reported as parasites of scarabaeid larvae. A few exotic species have been liberated in North America for control of economically important pest scarab species. Hosts of the other genera of Tiphinae are unknown. In the Myzininae, species of *Myzinum* Latr. have scarabaeid larvae as hosts; it is anticipated that our native *Pterombrus* Sm. parasitize tiger beetle larvae as do some of the Neotropical species. Biology is unknown for the Anthoboscinae and Brachycistidinae, but the species probably have as hosts deserticolous scarabaeid larvae. The Methochinae parasitize tiger beetle larvae, and the Myrmosinae are parasites of ground-nesting aculeate Hymenoptera.

Revision: Allen, 1965. *Acad. Nat. Sci. Phila.*, Proc. 117: 45-115, 30 figs. (western North America species). — Allen, 1966. *Amer. Ent. Soc., Trans.* 92: 231-356, 40 figs., 19 maps (eastern North America species).

Taxonomy: Ashmead, 1903. *Canad. Ent.* 35: 4-7, 39-41, 155-156, 201-204. — Krombein, 1940. *Amer. Ent. Soc., Trans.* 65: 419. — Pate, 1947. *N. Y. Ent. Soc., Jour.* 55: 115-143.

#### SUBFAMILY TIPHIINAE

Taxonomy: Hedicke, 1936. *Hym. Cat., Pars. 1*, Tiphidae, pp. 1-32 (catalog of world species). — Allen, 1962. *Ent. Soc. Amer., Trans.* 88: 21-75, 30 figs. (redescription of types of American species in British museum).

#### Genus TIPHIA Fabricius

##### Genus TIPHIA Subgenus TIPHIA Fabricius

*Tiphia* Fabricius, 1775. *Systema Ent.*, p. 553.

Type-species: *Tiphia femorata* Fabricius. Desig. by Latreille, 1810.

*Tiphiana* (!) Rafinesque, 1815. *Analyse Nat.*, p. 124. Emend.

So far as is known species of this subgenus parasitize larvae of various Scarabaeidae (Coleoptera). Detailed liberation records of the Oriental species released in the United States for control of the introduced *Popillia*, *Anomala*, *Autoserica*, and *Serica* were published by

Krombein (1948, Ent. Soc. Amer., Ann. 41: 58-62). Of the liberated species only *vernalis* Rohwer, *popilliaevora* Rohwer, and *asericae* Allen and Jaynes established themselves; *sternata* Parker is doubtfully established; *biseculata* Allen and Jaynes, *castaneaeavora* Parker, *chosensis* Allen, *frater* Parker, *matura* Allen and Jaynes, *notopolita* var. *alleni* Roberts, *pullivora* Allen and Jaynes, and *totopunctata* Allen and Jaynes apparently did not become established.

*Tiphia femorata* Fabricius and *T. morio* Fabricius were introduced from Europe and liberated in New York in 1956 and 1957 for control of *Amphimallon majalis* (Raz.), the European chafer; so far as is known neither species became established.

Only the typical subgenus occurs in the New World.

Revision: Malloch, 1918. Ill. Nat. Hist. Survey, Bul. 13: 1-24, 13 figs. (eastern species).

—Allen, 1971. Amer. Ent. Soc., Trans. 97: 201-359, 147 figs., 13 maps (species of western North America).

Taxonomy: Allen, 1961. Amer. Ent. Soc., Trans. 87: 1-20 (key to species north of Mexico).

—Evans, 1965. Ent. Soc. Wash., Proc. 67: 91 (larva).

**alamosae** Allen. Colo. (Alamosa Co.); Mexico (Chihuahua).

*Tiphia alamosae* Allen, 1965. Acad. Nat. Sci. Phila., Proc. 117: 54, figs. 1, 6, 11. ♂, ♀.

Taxonomy: Allen, 1971. Amer. Ent. Soc., Trans. 97: 264, figs. 63-68, map 5. ♂, ♀.

**andersoni** Allen. Ariz. south in Mexico to Michoacan and Morelos.

*Tiphia andersoni* Allen, 1971. Amer. Ent. Soc., Trans. 97: 288, figs. 100-103, map 8. ♂, ♀.

**anguis** Allen. Wyo., B. C. to Calif.

*Tiphia anguis* Allen, 1971. Amer. Ent. Soc., Trans. 97: 278, figs. 94-98, map 7. ♂, ♀.

**arcuata** Allen. Ariz. (Chiricahua Mts.).

*Tiphia arcuata* Allen, 1971. Amer. Ent. Soc., Trans. 97: 315, figs. 127, 129, 130, map 11. ♀.

**asensoria** Allen. Fla. (Fort Lauderdale).

*Tiphia asensoria* Allen, 1966. Amer. Ent. Soc., Trans. 92: 317, map 12. ♂.

**asericae** Allen and Jaynes. N. Y., N. J., Pa.; Korea. Introduced from Korea. Host: *Autoserica castanea* (Arrow); *Serica peregrina* Chapin.

*Tiphia asericarum* Allen and Jaynes, 1930. U. S. Natl. Mus., Proc. 76 (17): 74. ♀, ♂.

Biology: Clausen, Jaynes, and Gardner, 1933. U. S. Dept. Agr., Tech. Bul. 366: 45-46.

—Gardner and Parker, 1940. U. S. Dept. Agr., Tech. Bul. 738: 21. —Clausen, 1956. U. S. Dept. Agr., Tech. Bul. 1139: 131 (life history).

**atlantis** Allen. N. H. to Fla., Mich., Ill., Kans., Ariz. ?

*Tiphia atlantis* Allen, 1934. Amer. Ent. Soc., Trans. 60: 314. ♀.

Taxonomy: Allen, 1961. Amer. Ent. Soc., Trans. 87: 16. ♂. —Allen, 1966. Amer. Ent. Soc., Trans. 92: 336, figs. 23, 32, map 17. ♀, ♂.

**barberi** Allen. Mont., Wyo., Ariz.

*Tiphia barberi* Allen, 1965. Acad. Nat. Sci. Phila., Proc. 117: 57, figs. 13, 28, 29. ♂.

Taxonomy: Allen, 1971. Amer. Ent. Soc., Trans. 97: 270, figs. 75-78, map 6. ♂, ♀.

**berbereti** Allen. Nebr. (Ainsworth). Host: *Phyllophaga anxia* (LeC.).

*Tiphia berbereti* Allen, 1970. Ent. Soc. Amer., Ann. 63: 473. ♀, ♂.

Taxonomy: Allen, 1971. Amer. Ent. Soc., Trans. 97: 274, figs. 82-85, map 6. ♀, ♂.

Biology: Berberet and Helms, 1970. Ent. Soc. Amer., Ann. 63: 471-473 (life history).

**biseculata** Allen and Jaynes. Liberated in N. Y. and N. J. but not established. Introduced from Japan. Host: *Anomala orientalis* Waterh.; *Popillia japonica* Newm.

*Tiphia biseculata* Allen and Jaynes, 1930. U. S. Natl. Mus., Proc. 76, Art. 17: 85, figs. 30, 31. ♀, ♂.

Biology: Clausen, Jaynes and Gardner, 1933. U. S. Dept. Agr., Tech. Bul. 366: 38-39 (life history).

**boharti** Allen. Oreg. (Bend).

*Tiphia boharti* Allen, 1971. Amer. Ent. Soc., Trans. 97: 287, map 8. ♂.

**canamexica** Rohwer. Mont., S. Dak., Colo., Utah, Calif., Ariz. south in Mexico to Chiapas and Yucatan.

*Tiphia canamexica* Rohwer, 1912. U. S. Natl. Mus., Proc. 41: 452. ♀.

*Tiphia dreisbachi* Allen, 1965. Acad. Nat. Sci. Phila., Proc. 117: 70. ♂, ♀.

*Tiphia canamexicana* (!) Allen, 1965. Acad. Nat. Sci. Phila., Proc. 117: 85. ♀.

Taxonomy: Allen, 1971. Amer. Ent. Soc., Trans. 97: 243, figs. 41-43, map 3. ♂, ♀.

**castaneaevora** Parker. Liberated in N. J. and Pa. but not established. Introduced from Japan.

Host: *Autoserica castanea* (Arrow).

*Tiphia castaneaevora* Parker, 1937. N. Y. Ent. Soc., Jour. 45: 288. ♀, ♂.

**chosensis** Allen. Liberated in Conn. and N. J. but not established. Introduced from Korea.

Host: *Anomala orientalis* Waterh.

*Tiphia (Tiphia) chosensis* Allen, 1969. Amer. Ent. Soc., Trans. 95: 359. ♀, ♂.

Taxonomy: Allen and Jaynes, 1930. U. S. Natl. Mus., Proc. 76, Art. 17: 66, figs. 2, 5, 7, 11, 24. ♀, ♂. (Misdet. as *bicarinata* Cameron).

Biology: Clausen, Jaynes and Gardner, 1933. U. S. Dept. Agr., Tech. Bul. 366: 43-44 (life history, as *bicarinata*).

**cochiseae** Allen. N. Mex., Ariz., south in Mexico to Jalisco and Puebla.

*Tiphia cochiseae* Allen, 1971. Amer. Ent. Soc., Trans. 97: 282, fig. 99, map 7. ♂.

**coloradensis** Allen. Colo.

*Tiphia coloradensis* Allen, 1971. Amer. Ent. Soc., Trans. 97: 314, fig. 126, map 11. ♀.

**conformis** Malloch. Mass., Mich. and Nebr. south to Fla. and Tex., Ariz.

*Tiphia conformis* Malloch, 1918. Ill. Nat. Hist. Survey, Bul. 13: 22. ♀, ♂.

*Tiphia imitatrix* Malloch, 1918. Ill. Nat. Hist. Survey, Bul. 13: 22. ♀.

Taxonomy: Frison, 1927. Ill. Nat. Hist. Survey, Bul. 16: 229 (lectotype designation *conformis*). — Allen, 1934. Amer. Ent. Soc., Trans. 60: 312. — Allen, 1966. Amer. Ent. Soc., Trans. 92: 295, fig. 14, map 10. ♂, ♀.

**convexa** Allen. N. H. to N. C., Mich., Kans., Mont.

*Tiphia convexa* Allen, 1934. Amer. Ent. Soc., Trans. 60: 306. ♂.

Taxonomy: Allen, 1966. Amer. Ent. Soc., Trans. 92: 290, map 9. ♂, ♀.

**crassipunctata** Allen. N. C.

*Tiphia crassipunctata* Allen, 1934. Amer. Ent. Soc., Trans. 60: 307. ♂.

Taxonomy: Allen, 1966. Amer. Ent. Soc., Trans. 92: 254, map 3. ♂.

**dallasae** Allen. Tex. (Dallas, Victoria).

*Tiphia dallasae* Allen, 1966. Amer. Ent. Soc., Trans. 92: 339, fig. 9, map 17. ♀.

**dawsoni** Allen. Nebr., Mont., Idaho, Tex.

*Tiphia dawsoni* Allen, 1971. Amer. Ent. Soc., Trans. 97: 259, fig. 62, map 5. ♂.

**dentonae** Allen. Tex., Kans.

*Tiphia dentonae* Allen, 1966. Amer. Ent. Soc., Trans. 92: 300, map 10. ♂.

**dryophila** Krombein. N. J., N. C., Fla., Ohio.

*Tiphia dryophila* Krombein, 1953. Wasmann Jour. Biol. 10: 301. ♂, ♀.

Taxonomy: Allen, 1966. Amer. Ent. Soc., Trans. 92: 299, map 10. ♂, ♀.

**egregia** Viereck. N. H. to S. Dak., south to Fla. and Tex.

*Tiphia egregia* (!) Viereck, 1906. Ent. News 17: 303. ♂.

*Tiphia egregia* Viereck, 1906. Ent. News 17: 350.

*Tiphia tuberculata* Malloch, 1918. Ill. Nat. Hist. Survey, Bul. 13: 14. ♀, ♂. Preocc.

*Tiphia aterrima* Malloch, 1918. Ill. Nat. Hist. Survey, Bul. 13: 19. ♀.

*Tiphia papillata* Roberts, 1930. Canad. Ent. 62: 190. N. name.

*Tiphia diminuta* Roberts, 1933. Kans. Ent. Soc., Jour. 6: 91. ♀, ♂.

Taxonomy: Frison, 1927. Ill. Nat. Hist. Survey, Bul. 16: 229-230 (lectotype designation *aterrima, tuberculata*). — Allen, 1934. Amer. Ent. Soc., Trans. 60: 312. — Allen, 1966. Amer. Ent. Soc., Trans. 92: 325, fig. 34, map 15. ♂, ♀.

**elaka** Allen. Fla.

*Tiphia elaka* Allen, 1966. Amer. Ent. Soc., Trans. 92: 289, fig. 6, map 9. ♂.

**femorata** Fabricius. Liberated in N. Y. but not established. Introduced from Europe. Host:

*Amphimallon majalis* (Raz.).

*Tiphia femorata* Fabricius, 1775. *Systema Ent.*, p. 353. ♀.

*Spheg palmipes* Schrank, 1781. *Enum. Ins. Austriae*, p. 384.

*Bethylus glabrata* Fabricius, 1798. *Sup. Ent. System.*, p. 254.

*Bethylus villosa* Fabricius, 1804. *Systema Piezatorum*, p. 236.

*Bethylus pilipennis* Klug, 1808. *Mag. Gesell. Naturf. Freunde Berlin* 2: 49. ♂.

*Bethylus ater* Giraud, 1856. *Zool.-Bot. Ver., Verhandl.* 6: 184.

*Tiphia laeviceps* Tournier, 1889. *Soc. Ent. Belg., Ann.* 33: 21. ♀.

*Tiphia austriaca* Tournier, 1889. *Soc. Ent. Belg., Ann.* 33: 24. ♀.

**fenestrata** Klug. N. J., N. C., Fla., Ill., Miss., La.

*Bethylus fenestratus* Klug, 1810. *In Weber, Beitr. z. Naturk.* 2: 193. ♀.

*Tiphia confusa* Allen, 1934. *Amer. Ent. Soc., Trans.* 60: 302. ♀.

Taxonomy: Allen, 1966. *Amer. Ent. Soc., Trans.* 92: 253. ♀. — Allen, 1972. *Ent. Soc. Wash., Proc.* 74: 381-383 (redescription and synonymy).

**fisheri** Allen. Va. (Cape Henry).

*Tiphia fisheri* Allen, 1966. *Amer. Ent. Soc., Trans.* 92: 301, map 10. ♂.

**flavipennis** Spinola. Calif. (?); Mexico (Guerrero).

*Tiphia flavipennis* Spinola, 1841. *Soc. Ent. France, Ann.* 10: 102. ♀.

*Tiphia elegans* Cameron, 1893. *Biol. Cent.-Amer., Hym.*, v. 2, p. 240. ♀, ♂.

*Tiphia ochroptera* Dalla Torre, 1897. *Cat. Hym.*, v. 8, p. 139. N. name err. proposed for *flavipennis* Spinola, not Smith, 1857.

Taxonomy: Turner, 1908. *Ann. and Mag. Nat. Hist.* (8) 2: 131 (synonymy). — Allen, 1962. *Amer. Ent. Soc., Trans.* 88: 38 (redescription *elegans* female).

**floridana flvida** Allen. Central Fla.

*Tiphia floridana flvida* Allen, 1966. *Amer. Ent. Soc., Trans.* 92: 279, map 7. ♀, ♂.

**floridana floridana** Robertson. N. Y. to Fla.

*Tiphia floridana* Robertson, 1901. *Amer. Ent. Soc., Trans.* 27: 195. ♀, ♂.

Taxonomy: Malloch, 1918. *Ill. Nat. Hist. Survey, Bul.* 13: 23. — Allen, 1934. *Amer. Ent. Soc., Trans.* 60: 314. — Krombein, 1953. *Wasmann Jour. Biol.* 10: 305. — Allen, 1966. *Amer. Ent. Soc., Trans.* 92: 276, figs. 5, 33, 38, map 7. ♂, ♀.

**fortistriolata** Cameron. B. C. south to Calif. and N. Mex.; Mexico (Michoacan, Morelos, Veracruz).

*Tiphia fortistriolata* Cameron, 1907. *Invertebrata Pacifica* 1: 170. ♂.

*Tiphia bakeri* Allen, 1961. *Amer. Ent. Soc., Trans.* 87: 12. ♂.

Taxonomy: Allen, 1965. *Acad. Nat. Sci. Phila., Proc.* 117: 50, 74, figs. 4, 15, 27. ♀. — Allen, 1969. *Amer. Ent. Soc., Trans.* 95: 433. ♂. — Allen, 1971. *Amer. Ent. Soc., Trans.* 97: 229, figs. 23-27, map 1. ♂, ♀.

**frater** Parker. Liberated in N. J. but not established. Introduced from China.

*Tiphia frater* Parker, 1935. *N. Y. Ent. Soc., Jour.* 43: 397. ♀, ♂.

**fulvicauda** Cameron. Nev. (Ormsby Co.).

*Tiphia fulvicauda* Cameron, 1907. *Invertebrata Pacifica* 1: 169. ♀.

Taxonomy: Allen, 1962. *Amer. Ent. Soc., Trans.* 88: 24 (type redescription).

**gehlshachi** Allen. Tex.

*Tiphia gehlshachi* Allen, 1971. *Amer. Ent. Soc., Trans.* 97: 237, figs 32-34, map 2. ♂.

**greenei** Allen. Md. (Plummers Island).

*Tiphia greenei* Allen, 1966. *Amer. Ent. Soc., Trans.* 92: 256, fig. 31, map 3. ♂.

**greeleyi** Allen. Kans. (Greeley Co.).

*Tiphia greeleyi* Allen, 1971. *Amer. Ent. Soc., Trans.* 97: 258, map 5. ♂.

**illinoensis** Robertson. N. H., Ont., Mich., Ill. and Iowa south to Fla. and Tex.

*Tiphia illinoensis* Robertson, 1901. *Amer. Ent. Soc., Trans.* 27: 196. ♀, ♂.

*Tiphia waldonii* (!) Viereck, 1906. *Ent. News* 17: 302. ♂.

*Tiphia brunneicornis* Viereck, 1906. *Ent. News* 17: 303. ♂.

*Tiphia waldonii* Viereck, 1906. *Ent. News* 17: 350.

- Tiphia robertsoni* Malloch, 1918. Ill. Nat. Hist. Survey, Bul. 13: 23. ♀.  
*Tiphia waldeni* (!) Malloch, 1918. Ill. Nat. Hist. Survey, Bul. 13: 23.
- Taxonomy: Malloch, 1918. Ill. Nat. Hist. Survey, Bul. 13: 24. ♂. — Frison, 1927. Ill. Nat. Hist. Survey, Bul. 16: 230 (lectotype designation, *robertsoni*). — Allen, 1934. Amer. Ent. Soc., Trans. 60: 313. — Allen, 1961. Amer. Ent. Soc., Trans. 87: 18. — Allen, 1966. Amer. Ent. Soc., Trans. 92: 280, figs. 4, 27, 35, map 8. ♂, ♀.
- inaequalis* Malloch. Mass. to Nebr., south to Ga., Ala. and Tex.  
*Tiphia inaequalis* Malloch, 1918. Ill. Nat. Hist. Survey, Bul. 13: 22. ♂.
- Taxonomy: Frison, 1927. Ill. Nat. Hist. Survey, Bul. 16: 229-230 (lectotype designation). — Allen, 1966. Amer. Ent. Soc., Trans. 92: 293, fig. 29, map 10. ♂.
- incisurata* Malloch N. C.  
*Tiphia incisurata* Malloch, 1918. Ill. Nat. Hist. Survey, Bul. 13: 17. ♀.
- Taxonomy: Allen, 1966. Amer. Ent. Soc., Trans. 92: 288, map 9. ♀.
- indistincta* Allen. W. Va. (Kanawha Sta.).  
*Tiphia indistincta* Allen, 1961. Amer. Ent. Soc., Trans. 87: 14. ♀.
- Taxonomy: Allen, 1966. Amer. Ent. Soc., Trans. 92: 254, map 3. ♀.
- infossata* Allen. Maine to Mich., Wis., Iowa and S. Dak., south to Fla. and Tex., Alta., Mont., Colo., Calif.  
*Tiphia infossata* Allen, 1934. Amer. Ent. Soc., Trans. 60: 301. ♀.  
*Tiphia hollowayi* Allen, 1934. Amer. Ent. Soc., Trans. 60: 303. ♂.
- Taxonomy: Allen, 1961. Amer. Ent. Soc., Trans. 87: 19 (synonymy). — Allen, 1965. Acad. Nat. Sci., Phila., Proc. 117: 60. — Allen, 1966. Amer. Ent. Soc., Trans. 92: 248, figs. 8, 16, 21, 36, map 2. ♀, ♂. — Allen, 1971. Amer. Ent. Soc., Trans. 97: 275, figs. 86-89, map 6. ♀, ♂.
- inornata* Say. Ohio, Pa.  
*Tiphia inornata* Say, 1824. In Keating, Narr. Long's 2nd Exped., v. 2, p. 331 ♀.
- Taxonomy: Malloch, 1918. Ill. Nat. Hist. Survey, Bul. 13: 12. — Allen, 1934. Amer. Ent. Soc., Trans. 60: 300 (redescription). — Allen, 1966. Amer. Ent. Soc., Trans. 92: 262. ♀.  
 (Redescription.)
- intermedia* Malloch. Maine and Que. south to Fla., west to N. Dak. and Calif., south to Nicaragua. Host: *Phyllophaga* spp.  
*Tiphia punctata* Robertson, 1901. Amer. Ent. Soc., Trans. 27: 196. ♂. Preocc.  
*Tiphia clypeolata* Malloch, 1918. Ill. Nat. Hist. Survey, Bul. 13: 16. ♀, ♂ (in part?).  
*Tiphia arida* Malloch, 1918. Ill. Nat. Hist. Survey, Bul. 13: 20. ♀.  
*Tiphia punctata* var. *intermedia* Malloch, 1918. Ill. Nat. Hist. Survey Bul. 13: 21. ♀.  
*Tiphia reticulata* Malloch, 1918. Ill. Nat. Hist. Survey, Bul. 13: 23. ♀.  
*Tiphia intermedia* var. *exitialis* Roberts, 1930. Canad. Ent. 62: 189. N. name.
- Taxonomy: Frison, 1927. Ill. Nat. Hist. Survey, Bul. 16: 230 (lectotype designation, *punctata* var. *intermedia*). — Allen, 1934. Amer. Ent. Soc., Trans. 60: 310. — Krombein, 1938. Ent. News 49: 186. — Allen, 1965. Acad. Nat. Sci. Phila., Proc. 117: 56. — Allen, 1966. Amer. Ent. Soc., Trans. 92: 302, figs. 10, 12, 15, 17, 26, 37, 40, map 11. ♂, ♀. — Allen, 1971. Amer. Ent. Soc., Trans. 97: 268, figs. 69-72, map 6. ♂, ♀.
- Biology: Davis, 1919. Ill. Nat. Hist. Survey, Bul. 13: 59-68.
- irfla* Allen. Fla.  
*Tiphia irfla* Allen, 1961. Amer. Ent. Soc., Trans. 87: 10. ♂, ♀.
- Taxonomy: Allen, 1966. Amer. Ent. Soc., Trans. 92: 314, map 12.
- jaynesi* Allen. Que. and Vt. to Fla., La., Okla., Kans., Ill.  
*Tiphia jaynesi* Allen, 1934. Amer. Ent. Soc., Trans. 60: 311. ♀, ♂.
- Taxonomy: Allen, 1966. Amer. Ent. Soc., Trans. 92: 315, map 13. ♂, ♀.
- krombeini* Allen. N. H. and Ont. to N. C., W. Va., Mich., S. Dak., ? Tex.  
*Tiphia krombeini* Allen, 1966. Amer. Ent. Soc., Trans. 92: 321, map 14. ♀, ♂.
- letal* Roberts. N. Y. to N. C., west to S. Dak. and Kans., Miss.  
*Tiphia clypeata* Robertson, 1901. Amer. Ent. Soc., Trans. 27: 196. ♂. Preocc.

- Tiphia letalis* Roberts, 1930. Canad. Ent. 62: 189. N. name.
- Taxonomy: Malloch, 1918. Ill. Nat. Hist. Survey, Bul. 13: 11. ♀, ♂. — Allen, 1966. Amer. Ent. Soc., Trans. 92: 257, figs. 1, 3, 11, map 4. ♂, ♀.
- matura** Allen and Jaynes. Liberated in N. J. but not established. Introduced from India. Host: *Popillia japonica* Newm.
- Tiphia matura* Allen and Jaynes, 1930. U. S. Natl. Mus., Proc. 76, Art. 17: 81. ♀, ♂.
- micropunctata** Allen. N. S. to Man., Mont. and Calif., south to Fla. and Okla.
- Tiphia micropunctata* Allen, 1934. Amer. Ent. Soc., Trans. 60: 297. ♀, ♂.
- Tiphia dentata* Allen, 1934. Amer. Ent. Soc. Trans. 60: 303. ♂.
- Taxonomy: Allen, 1961. Amer. Ent. Soc., Trans. 87: 18 (synonymy). — Evans, 1965. Ent. Soc. Wash., Proc. 67: 90-91, figs. 6-10 (larva). — Allen, 1966. Amer. Ent. Soc., Trans. 92: 243, figs. 7, 13, 22, 25, map 1. ♀, ♂.
- minor** Provancher. B. C. (Vancouver Isl.), ? Wash., ? Oreg.
- Tiphia minor* Provancher, 1887. Addit. Corr. Faune Ent. Canada Hym., p. 254. ♂.
- Taxonomy: Allen, 1965. Acad. Nat. Sci. Phila., Proc. 117: 65. ♂. — Allen, 1971. Amer. Ent. Soc., Trans. 97: 294, map 8.
- montana** Allen. Sask., Alta., Mont., Utah, Ariz.; Mexico (Jalisco).
- Tiphia montana* Allen, 1961. Amer. Ent. Soc., Trans. 87: 13. ♂.
- Taxonomy: Allen, 1965. Acad. Nat. Sci. Phila., Proc. 117: 53, fig. 22. ♂. — Allen, 1971. Amer. Ent. Soc., Trans. 97: 234, figs. 30, 31, map 2. ♂.
- morio** Fabricius. Liberated in N. Y. but not established. Introduced from Europe. Host: *Amphimallon majalis* (Raz.).
- Tiphia morio* Fabricius, 1787. Mantissa Insectorum, v. 1, p. 280.
- nebra** Allen. Nebr., Ky.
- Tiphia nebra* Allen, 1966. Amer. Ent. Soc., Trans. 92: 261, map 3. ♀.
- nevadana** Cameron. B. C. south to Calif., Idaho, Wyo., Nev., Colo., Ariz., N. Mex., Tex; Mexico (Hidalgo).
- Tiphia nevadana* Cameron, 1906. Invertebrata Pacifica 1: 157. ♂.
- Tiphia essigi* Allen, 1965. Acad. Nat. Sci. Phila., Proc. 117: 62, figs. 7, 9, 26. ♀, ♂.
- Taxonomy: Allen, 1962. Amer. Ent. Soc., Trans. 88: 22 (type redescription). — Allen, 1971. Amer. Ent. Soc., Trans. 97: 298, figs. 115, 116, map 9. ♂, ♀.
- nona** Allen. Ariz. south in Mexico to San Luis Potosi and Michoacan.
- Tiphia nona* Allen, 1965. Acad. Nat. Sci. Phila., Proc. 117: 61. ♂.
- Tiphia hurdi* Allen, 1965. Acad. Nat. Sci. Phila., Proc. 117: 75, fig. 24. ♂, ♀.
- Taxonomy: Allen, 1971. Amer. Ent. Soc., Trans. 97: 248, figs. 46-48, map 4. ♂, ♀.
- notopolita** var. **alleni** Roberts. Liberated in N. Y., but not established. Introduced from Korea and China. Host: *Anomala orientalis* Waterh.
- Tiphia notopolita* var. *intermedia* Allen and Jaynes, 1930. U. S. Natl. Mus., Proc. 76, Art. 17: 41. ♀. Preocc.
- Tiphia notopolita* var. *alleni* Roberts, 1930. Canad. Ent. 62: 190. N. name.
- Biology: Clausen, Jaynes and Gardner, 1933. U. S. Dept. Agr., Tech. Bul. 366: 46 (life history).
- occidentata** Malloch. Wash., Colo., N. Mex., Ariz. south in Mexico to Oaxaca.
- Tiphia occidentata* Malloch, 1918. Ill. Nat. Hist. Survey, Bul. 13: 17. ♂.
- Taxonomy: Allen, 1965. Acad. Nat. Sci. Phila., Proc. 117: 52. ♂. — Allen, 1971. Amer. Ent. Soc., Trans. 97: 241, figs. 38-40, map 3. ♂.
- odontogaster** Viereck. N. Mex., Ariz.; Mexico (Durango).
- Tiphia odontogaster* Viereck, 1903. Amer. Ent. Soc., Trans. 29: 71. ♂.
- Taxonomy: Malloch, 1918. Ill. Nat. Hist. Survey, Bul. 13: 13. — Allen, 1965. Acad. Nat. Sci. Phila., Proc. 117: 51, fig. 21. ♂. — Allen, 1971. Amer. Ent. Soc., Trans. 97: 232, figs. 28, 29, map 2.

**pecosae** Allen. Tex. (Pecos River at Sheffield).

*Tiphia pecosae* Allen, 1971. Amer. Ent. Soc., Trans. 97: 311, fig. 123. ♀.

**pennsylvanica** Allen. N. J. to Fla., La.

*Tiphia pennsylvanica* Allen, 1961. Amer. Ent. Soc., Trans. 87: 15. ♀.

Taxonomy: Allen, 1966. Amer. Ent. Soc., Trans. 92: 286, map 9. ♀, ♂.

**popilliavora** Rohwer. N. H., Mass., Conn., N. Y., N. J., Pa., Del., Md., Va., Ohio. Introduced from Japan and Korea. Host: *Popillia japonica* Newm.

*Tiphia popilliavora* Rohwer, 1924. Ent. Soc. Wash., Proc. 26: 89. ♀, ♂.

Taxonomy: Allen and Jaynes, 1930. U. S. Natl. Mus., Proc. 76, Art. 17: 51, figs. 3, 21, 22, 27, 28. ♀, ♂.

Biology: Clausen, King, and Teranishi, 1927. U. S. Dept. Agr., Bul. 1429: 33-39. — King and Holloway, 1930. Jour. Econ. Ent. 23: 266-274. — Holloway, 1931. N. Y. Ent. Soc., Jour. 39: 555-564. — White, 1943. N. Y. Ent. Soc., Jour. 51: 213-218.

**portalae** Allen. Ariz., Nev.

*Tiphia portalae* Allen, 1965. Acad. Nat. Sci. Phila., Proc. 117: 49. ♂.

Taxonomy: Allen, 1971. Amer. Ent. Soc., Trans. 97: 226, figs. 17, 18, map 1. ♂, ♀.

**pullivora** Allen and Jaynes. Liberated in Pa. but not established. Introduced from India. Host: *Popillia japonica* Newm.

*Tiphia pullivora* Allen and Jaynes, 1930. U. S. Natl. Mus., Proc. 76, Art. 17: 83. ♀, ♂.

Biology: Clausen, Jaynes and Gardner, 1933. U. S. Dept. Agr., Tech. Bul. 366: 39-41 (life history).

**puncticeps** Cameron Nev.; ? Mexico (Michoacan).

*Tiphia puncticeps* Cameron, 1906. Invertebrata Pacifica 1: 158. ♂.

Taxonomy: Allen, 1962. Amer. Ent. Soc., Trans. 88: 23 (type redescription). — Allen, 1971. Amer. Ent. Soc., Trans. 97: 246, map 4. ♂.

**pygidialis** Allen. Conn., Pa., Md., W. Va., Ky., Iowa, Kans., Okla., Miss.

*Tiphia pygidialis* Allen, 1966. Amer. Ent. Soc., Trans. 92: 310, map 12. ♀.

**raui** Allen. Mo., Miss.

*Tiphia raui* Allen, 1934. Amer. Ent. Soc., Trans. 60: 308. ♀.

Taxonomy: Allen, 1966. Amer. Ent. Soc., Trans. 92: 269. ♀.

**relativa** Viereck. Maine to Ga., Mich., Iowa, Nebr., Kans. Host: *Cyclocephala borealis* Arrow; *Lichnathes vulpina* (Hentz).

*Tiphia relativa* Viereck, 1906. Ent. News 17: 304. ♂.

*Tiphia winnemananae* Malloch, 1918. Ill. Nat. Hist. Survey, Bul. 13: 23. ♂.

Taxonomy: Allen, 1961. Amer. Ent. Soc., Trans. 87: 17 (synonymy). — Allen, 1966. Amer. Ent. Soc., Trans. 92: 312, map 12. ♂, ♀.

Biology: Adams, 1949. Jour. Econ. Ent. 42: 626. — Franklin, 1950. Mass. Agr. Expt. Sta., Bul. 445, pts. 2-7: 63, 66, 67.

**roda** Allen. N. Mex., Ariz.

*Tiphia roda* Allen, 1965. Acad. Nat. Sci. Phila., Proc. 117: 56. ♂.

Taxonomy: Allen, 1971. Amer. Ent. Soc., Trans. 97: 286, map 8. ♂.

**rodeoensis** Allen. N. Mex. south in Mexico to Jalisco and Morelos.

*Tiphia rodeoensis* Allen, 1971. Amer. Ent. Soc., Trans. 97: 336, fig. 143, map 13. ♀.

**roosevelti** Allen. Ariz.

*Tiphia roosevelti* Allen, 1971. Amer. Ent. Soc., Trans. 97: 339, figs. 145-147, map 13. ♀.

**rothi** Allen. Ariz. (Cochise Co.).

*Tiphia rothi* Allen, 1971. Amer. Ent. Soc., Trans. 97: 231, map 1. ♂.

**rugulosa** Malloch. Maine and Que. to Ga., west to Minn., Iowa and Kans.

*Tiphia rugulosa* Malloch, 1918. Ill. Nat. Hist. Survey, Bul. 13: 15. ♀, ♂.

Taxonomy: Frison, 1927. Ill. Nat. Hist. Survey, Bul. 16: 230 (lectotype designation). — Allen, 1966. Amer. Ent. Soc., Trans. 92: 333, fig. 30, map 16. ♂, ♀.

*sayi* Allen. N. H., Ont., Wis. and Iowa south to Fla. and Miss.

*Tiphia sayi* Allen, 1966. Amer. Ent. Soc., Trans. 92: 272, fig. 18, map 6. ♂, ♀.

*schlingerii* Allen. Tex., N. Mex., Ariz., Nev., Calif.

*Tiphia schlingerii* Allen, 1965. Acad. Nat. Sci. Phila., Proc. 117: 64, fig. 12. ♂.

Taxonomy: Allen, 1971. Amer. Ent. Soc., Trans. 97: 311, map 10. ♂.

*sculleni* Allen. Ariz. (Cochise and Pima Counties).

*Tiphia sculleni* Allen, 1965. Acad. Nat. Sci. Phila., Proc. 117: 60, fig. 25. ♂.

Taxonomy: Allen, 1971. Amer. Ent. Soc., Trans. 97: 291, figs. 104, 105, map 8.

*similis* Malloch. Maine and Que. south to Fla., west to Ont., Mich., Ill. and Kans.

*Tiphia similis* Malloch, 1918. Ill. Nat. Hist. Survey, Bul. 13: 18. ♂.

*Tiphia affinis* Malloch, 1918. Ill. Nat. Hist. Survey, Bul. 13: 19. ♀, ♂.

Taxonomy: Frison, 1927. Ill. Nat. Hist. Survey, Bul. 16: 229-230 (lectotype designations, *similis*, *affinis*). —Allen, 1966. Amer. Ent. Soc., Trans. 92: 318, figs. 20, 28, map 14. ♂, ♀.

*sinaloae* Allen. Okla., Tex., south to Costa Rica.

*Tiphia sinaloae* Allen, 1971. Amer. Ent. Soc., Trans. 97: 309, map 10. ♂.

*sternata* Parker. Liberated 1933-35 in N. Y., N. J., Pa. but has not been recovered since 1937.

Introduced from Japan. Host: *Serica peregrina* Chapin.

*Tiphia sternata* Parker, 1935. N. Y. Ent. Soc., Jour. 43: 399. ♀, ♂.

*strangulata* Allen. Mont., Ariz., ? Mexico (Puebla).

*Tiphia strangulata* Allen, 1971. Amer. Ent. Soc., Trans. 97: 261, fig. 73, map 5. ♂.

*subcarinata* Malloch. Mass. to Ga., W. Va., Mich., Ill.

*Tiphia subcarinata* Malloch, 1918. Ill. Nat. Hist. Survey, Bul. 13: 15. ♂.

*Tiphia insolita* Allen, 1934. Amer. Ent. Soc., Trans. 60: 316. ♂.

Taxonomy: Allen, 1966. Amer. Ent. Soc., Trans. 92: 330, map 16. ♂.

*tarda* Say. Ind.

*Tiphia tarda* Say, 1836. Boston Jour. Nat. Hist. 1: 300. ♂.

Taxonomy: Allen, 1966. Amer. Ent. Soc., Trans. 92: 351 (unrecognized).

*tegulina* Malloch. B. C. and Idaho to Calif. and Nev. Host: *Phyllophaga errans* LeC.

*Tiphia tegulina* Malloch, 1918. Ill. Nat. Hist. Survey, Bul. 13: 21. ♀.

*Tiphia shastensis* Krombein, 1942. Pan-Pacific Ent. 18: 139. ♀, ♂.

Taxonomy: Allen, 1965. Acad. Nat. Sci. Phila., Proc. 117: 59. —Allen, 1971. Amer. Ent. Soc., Trans. 97: 272, figs. 79-81, map 6. ♀, ♂.

Biology: Linsley and Michener, 1942. Pan-Pacific Ent. 18: 154.

*tempeae* Allen. Kans., Colo., Wash., Calif., Ariz. and N. Mex. south to Costa Rica.

*Tiphia tempeae* Allen, 1961. Amer. Ent. Soc., Trans. 87: 11. ♂.

Taxonomy: Allen, 1965. Acad. Nat. Sci. Phila., Proc. 117: 53, 80. ♂. —Allen, 1971. Amer. Ent. Soc., Trans. 97: 263, fig. 74, map 5. ♂, ♀.

*texensis* Malloch. Tex., Kans., Mont.

*Tiphia texensis* Malloch, 1918. Ill. Nat. Hist. Survey, Bul. 13: 20. ♀.

Taxonomy: Allen, 1961. Amer. Ent. Soc., Trans. 87: 19. —Allen, 1965. Acad. Nat. Sci. Phila., Proc. 117: 66. ♀.

*toddi* Allen. Ariz.; Mexico (Jalisco, Morelos).

*Tiphia toddi* Allen, 1971. Amer. Ent. Soc., Trans. 97: 252, fig. 50, map 4. ♂.

*totopunctata* Allen and Jaynes. Liberated in N. Y. but not established. Introduced from

Korea. Host: *Anomala orientalis* Waterh.

*Tiphia totopunctata* Allen and Jaynes, 1930. U. S. Natl. Mus., Proc. 76, Art. 17: 35. ♀.

Biology: Clausen, Jaynes and Gardner, 1933. U. S. Dept. Agr., Tech. Bul. 366: 44 (life history).

*townesi* Allen. N. Y. (Shokan).

*Tiphia townesi* Allen, 1966. Amer. Ent. Soc., Trans. 92: 338, map 17. ♂.



- transversa** Say. Vt. to Kans., south to Ga., Ala. and Tex. Host: *Phyllophaga* spp.  
*Tiphia transversa* Say, 1828. Contrib. Maclur. Lyc. Phila. 1: 83 ♂.
- Taxonomy: Malloch, 1918. Ill. Nat. Hist. Survey, Bul. 13: 11. — Allen, 1934. Amer. Ent. Soc., Trans. 60: 297. — Allen, 1966. Amer. Ent. Soc., Trans. 92: 270, fig. 19, map 6. ♂, ♀.
- Biology: Davis, 1919. Ill. Nat. Hist. Survey, Bul. 13: 68.
- treherni** Allen. B. C. to Calif.  
*Tiphia treherni* Allen, 1971. Amer. Ent. Soc., Trans. 97: 329, figs. 35, 36, map 12. ♀.
- truncata** Cameron. Nev. (Ormsby Co.).  
*Tiphia truncata* Cameron, 1906. Invertebrata Pacifica 1: 156. ♂.
- Taxonomy: Allen, 1962. Amer. Ent. Soc., Trans. 88: 22 (type unlocated).
- unica** Allen. N. C. to Fla., Ala., Tenn., Kans.  
*Tiphia unica* Allen, 1934. Amer. Ent. Soc., Trans. 60: 309. ♀.
- Taxonomy: Allen, 1966. Amer. Ent. Soc., Trans. 92: 267, fig. 2, map 5. ♀, ♂.
- uvaldae** Allen. Tex. (Uvalde Co.).  
*Tiphia uvaldae* Allen, 1971. Amer. Ent. Soc., Trans. 97: 313, fig. 124, map 11. ♀.
- vallis** Allen. Calif. (Kern and El Dorado Counties).  
*Tiphia vallis* Allen, 1971. Amer. Ent. Soc., Trans. 97: 334, map 12. ♀.
- veracruzae** Allen. Southern Ariz. to Panama.  
*Tiphia veracruzae* Allen, 1965. Acad. Nat. Sci. Phila., Proc. 117: 82, fig. 5. ♂, ♀.  
*Tiphia litoris* Allen, 1965. Acad. Nat. Sci. Phila., Proc. 117: 84. ♂, ♀.
- Taxonomy: Allen, 1971. Amer. Ent. Soc., Trans. 97: 295, figs. 108-114, map 9. ♂, ♀.
- vernalis** Rohwer. Mass., N. H., R. I., Conn., N. Y., N. J., Pa., Del., Md., D. C., Va., N. C., W. Va., Ohio; Orient. Introduced from Japan, Korea, and China. Host: *Popillia japonica* Newm.  
*Tiphia vernalis* Rohwer, 1924. Ent. Soc. Wash., Proc. 26: 91. ♀, ♂.
- Taxonomy: Allen and Jaynes, 1930. U. S. Natl. Mus., Proc. 76, Art. 17: 78, figs. 6, 16, 19, 25, 29.
- Biology: Clausen, King, and Teranishi, 1927. U. S. Dept. Agr., Bul. 1429: 40-41. — Balock, 1934. Jour. Econ. Ent. 27: 491-496. — White, 1943. N. Y. Ent. Soc., Jour. 51: 213-218.
- virotha** Allen. Ariz. (Cochise Co.); ? Mexico (Hidalgo).  
*Tiphia virotha* Allen, 1971. Amer. Ent. Soc., Trans. 97: 338, map 13. ♀.
- vulgaris** Robertson. Ill., Wis., Ind., Iowa, S. Dak., Kans., Mo., Tex. Host: *Phyllophaga* spp.  
*Tiphia vulgaris* Robertson, 1901. Amer. Ent. Soc., Trans. 27: 195. ♀, ♂.
- Taxonomy: Malloch, 1918. Ill. Nat. Hist. Survey, Bul. 13: 12. — Allen, 1934. Amer. Ent. Soc., Trans. 60: 305. — Allen, 1961. Amer. Ent. Soc., Trans. 87: 19. — Allen, 1966. Amer. Ent. Soc., Trans. 92: 263, fig. 39, map 5. ♂, ♀.
- Biology: Davis, 1919. Ill. Nat. Hist. Survey, Bul. 13: 69.
- yosemitensis** Allen. Nebr., Mont., Calif.  
*Tiphia yosemitensis* Allen, 1971. Amer. Ent. Soc., Trans. 97: 330, figs. 137-139, map 12. ♀.

#### Genus KROMBEINIA Pate

- Neotiphia* subg. *Krombeinia* Pate, 1947. N. Y. Ent. Soc., Jour. 55: 132.  
 Type-species: *Neotiphia chiricahua* Pate. Orig. design.
- Revision: Allen and Krombein, 1964. Amer. Ent. Soc., Trans. 89: 211-241.
- chiricahua** (Pate). Ariz. (Chiricahua).  
*Neotiphia chiricahua* Pate, 1939. Ent. News 50: 221. ♂, ♀.
- Taxonomy: Allen and Krombein, 1964. Amer. Ent. Soc., Trans. 89: 233. ♂, ♀.
- cristata** (Allen). Ariz., N. Mex.  
*Neotiphia cristata* Allen, 1935. Amer. Ent. Soc., Trans. 61: 59. ♀.
- Taxonomy: Allen and Krombein, 1964. Amer. Ent. Soc., Trans. 89: 238, figs. 3, 29. ♀.

jonesi Allen and Krombein. Ariz. (Douglas, Chiricahua, Huachuca Mts., Oracle).

*Krombeinia jonesi* Allen and Krombein, 1964. Amer. Ent. Soc., Trans. 89: 239, figs. 6, 65. ♂, ♀.

**robusta** (Allen). Tex.

*Neotiphia ocellata* Allen, 1935. Amer. Ent. Soc., Trans. 61: 56. ♀.

*Neotiphia robusta* Allen, 1935. Amer. Ent. Soc., Trans. 61: 64. ♂.

Taxonomy: Krombein, 1951. U. S. Dept. Agr., Monog. 2: 739 (synonymy). —Allen and Krombein, 1964. Amer. Ent. Soc., Trans. 89: 229, figs. 2, 30. ♂, ♀.

### Genus NEOTIPHIA Malloch

*Neotiphia* Malloch, 1918. Ill. Nat. Hist. Survey, Bul. 13: 9.

Type-species: *Neotiphia acuta* Malloch. Orig. desig.

Revision: Allen, 1935. Amer. Ent. Soc., Trans. 61: 53-65. —Allen and Krombein, 1964. Amer. Ent. Soc., Trans. 89: 211-214, 241-270.

**acuta** Malloch. Tex.

*Neotiphia acuta* Malloch, 1918. Ill. Nat. Hist. Survey, Bul. 13: 9. ♀, ♂.

Taxonomy: Frison, 1927. Ill. Nat. Hist. Survey, Bul. 16: 229 (lectotype designation). —Allen and Krombein, 1964. Amer. Ent. Soc., Trans. 89: 259, figs. 5, 46, 67. ♂.

**anima** Allen and Krombein. N. Mex., Ariz.

*Neotiphia anima* Allen and Krombein, 1964. Amer. Ent. Soc., Trans. 89: 262. ♀.

**barbata** Allen and Krombein. Ariz. (Continental, Tucson, Douglas).

*Neotiphia barbata* Allen and Krombein, 1964. Amer. Ent. Soc., Trans. 89: 264. ♂.

**cockerelli** Allen. Tex., N. Mex.

*Neotiphia cockerelli* Allen, 1935. Amer. Ent. Soc., Trans. 61: 62. ♂.

Taxonomy: Allen and Krombein, 1964. Amer. Ent. Soc., Trans. 89: 255, fig. 50. ♂, ♀.

**crawfordi** Allen. Tex.

*Neotiphia crawfordi* Allen, 1935. Amer. Ent. Soc., Trans. 61: 60. ♀.

*Neotiphia conspicua* Allen, 1935. Amer. Ent. Soc., Trans. 61: 61. ♂.

Taxonomy: Allen and Krombein, 1964. Amer. Ent. Soc., Trans. 89: 257, figs. 28, 41, 42. ♀, ♂.

**flavipennis** Allen and Krombein. Ariz., N. Mex. south in Mexico to Mexico and Hidalgo.

*Neotiphia flavipennis* Allen and Krombein, 1964. Amer. Ent. Soc., Trans. 89: 263. ♀.

*Neotiphia parma* Allen and Krombein, 1964. Amer. Ent. Soc., Trans. 89: 267, figs. 7, 54. ♂.

Taxonomy: Allen, 1965. Acad. Nat. Sci. Phila., Proc. 117: 87 (synonymy).

**luteipennis** (Cresson). Colo.

*Tiphia luteipennis* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 445. ♀.

Taxonomy: Malloch, 1918. Ill. Nat. Hist. Survey, Bul. 13: 10. —Allen and Krombein, 1964. Amer. Ent. Soc., Trans. 89: 260. ♀.

**novomexicana** Allen. N. Mex., Ariz.

*Neotiphia novomexicana* Allen, 1935. Amer. Ent. Soc., Trans. 61: 63. ♀.

*Neotiphia carinata* Krombein, 1938. Ent. Soc. Amer., Ann. 31: 59. ♂.

Taxonomy: Allen and Krombein, 1964. Amer. Ent. Soc., Trans. 89: 251, figs. 4, 9, 11, 18, 21, 25, 38, 49, 55, 60, 68. ♀, ♂.

**rioverdei** Allen and Krombein. Ariz. (Del Rio Verde).

*Neotiphia rioverdei* Allen and Krombein, 1964. Amer. Ent. Soc., Trans. 89: 263. ♀.

**rostrata** Allen. Ariz.

*Neotiphia rostrata* Allen 1935. Amer. Ent. Soc., Trans. 61: 64. ♂.

Taxonomy: Allen and Krombein, 1964. Amer. Ent. Soc., Trans. 89: 265, figs. 14, 53. ♂.

**sulcata** (Roberts). Mich., Iowa and S. Dak. south to Tex. and Ariz.; Mexico (Jalisco).

*Tiphia canaliculata* Malloch, 1918. Ill. Nat. Hist. Survey, Bul. 13: 10. ♂. Preocc.

*Tiphia sulcata* Roberts, 1930. Canad. Ent. 62: 190. N. name.

*Tiphia mexicana* Allen, 1935. Amer. Ent. Soc., Trans. 61: 57. ♀.

Taxonomy: Allen and Krombein, 1964. Amer. Ent. Soc., Trans. 89: 245, figs. 1, 8, 12, 17, 20, 23, 24, 27, 34, 44, 48, 56, 58, 59, 66. ♂, ♀.

**waltoni** Allen. Kans. and Colo. to Tex., N. Mex. and Ariz.; Mexico (Chihuahua, Durango).

*Neotiphia waltoni* Allen 1935. Amer. Ent. Soc., Trans. 61: 62. ♀.

*Neotiphia pima* Pate, 1939. Ent. News 50: 245. ♂, (♀ misdet.).

Taxonomy: Allen and Krombein, 1964. Amer. Ent. Soc., Trans. 89: 248, 254, fig. 15, 36, 37, 47, 62. ♀, ♂ (treat *waltoni* and *pima* as discrete species). —Allen, 1965. Acad. Nat. Sci. Phila., Proc. 117: 87 (synonymy).

### Genus PARATIPHIA Sichel

*Epomidiopteron* subg. *Paratiphia* Sichel, 1864. In Saussure and Sichel, Cat. Spec. Gen. Scol., p. 269.

Type-species: *Epomidiopteron Sumichrasti* Sichel. Monotypic.

Revision: Allen, 1968. Amer. Ent. Soc., Trans. 94: 25-109, 41 figs., 10 maps.

Taxonomy: Allen, 1965. Acad. Nat. Sci. Phila., Proc. 117: 89-107 (species of western U. S.).

**aequalis atrata** Allen. Calif., Ariz., Tex. south to El. Salvador. Typical *aequalis* Fox occurs in Baja California.

*Paratiphia aequalis atrata* Allen, 1963. Amer. Ent. Soc., Trans. 88: 228, figs. 5, 10, 15, 16. ♂, ♀.

Taxonomy: Allen, 1965. Acad. Nat. Sci. Phila., Proc. 117: 90, figs. 3, 20, 30. ♂, ♀. —Allen, 1968. Amer. Ent. Soc., Trans. 94: 33, figs. 1-3, map 1. ♂, ♀.

**albilabris** (Spinola). Calif.

*Tiphia albilabris* Spinola, 1841. Soc. Ent. France, Ann. 10: 102. ♂.

Taxonomy: Allen, 1968. Amer. Ent. Soc., Trans. 94: 107 (type not located).

**asotinae** Allen. Wash. and Nebr. south to Calif., Kans. and N. Mex.

*Paratiphia asotinae* Allen, 1963. Ent. News 74: 222. ♂, ♀.

Taxonomy: Allen, 1968. Amer. Ent. Soc., Trans. 94: 57, map 4. ♂, ♀.

**belfragei** Allen. Nebr. and Idaho to Tex. and Calif., south in Mexico to Hidalgo and Jalisco.

*Paratiphia belfragei* Allen, 1963. Ent. Soc. Amer., Ann. 56: 575, figs. 1, 2 c, d. ♂, ♀.

*Paratiphia insueta* Allen, 1963. Ent. Soc. Amer., Ann. 56: 576, figs. 1, 2 e. ♂.

Taxonomy: Allen, 1968. Amer. Ent. Soc., Trans. 94: 66, figs. 21, 23, 24, map 6. ♂, ♀.

**bridwelli** Allen. Kans., Tex., Ariz.; Mexico (Tamaulipas).

*Paratiphia bridwelli* Allen, 1963. Amer. Ent. Soc., Trans. 88: 231, figs. 1, 6, 11, 19. ♂.

Taxonomy: Allen, 1968. Amer. Ent. Soc., Trans. 94: 44, map 2. ♂.

**cincta** Allen. Calif., Nev., Ariz.; Mexico (Baja California).

*Paratiphia cincta* Allen, 1962. Ent. News 73: 262. ♂.

Taxonomy: Allen, 1965. Acad. Nat. Sci. Phila., Proc. 117: 98, 106, fig. 2. ♂. —Allen, 1968. Amer. Ent. Soc., Trans. 94: 78, figs. 13, 34, map 5. ♂, ♀.

**bradleyi** Allen. Tex. to Ariz., south in Mexico to Baja California and Veracruz.

*Paratiphia bradleyi* Allen, 1963. Amer. Ent. Soc., Trans. 88: 231, figs. 2, 7, 12. ♂.

*Paratiphia pachucae* Allen, 1965. Acad. Nat. Sci. Phila., Proc. 117: 101, fig. 17. ♂.

Taxonomy: Allen, 1968. Amer. Ent. Soc., Trans. 94: 49, map 3. ♂, ♀. —Betrem and Allen, 1970. Ent. Soc. Wash., Proc. 72: 71.

**claripennis** Cameron. B. C., Idaho, Nev., Calif. to Tex., south in Mexico to Baja California, Sinaloa and Puebla.

*Paratiphia claripennis* Cameron, 1905. Invertebrata Pacifica 1: 108. ♂.

*Paratiphia varipunctata* Cameron, 1905. Invertebrata Pacifica 1: 106. ♀.

*Paratiphia fuscinerva* Cameron, 1905. Invertebrata Pacifica 1: 107. ♀.

*Paratiphia bakeri* Cameron, 1905. Invertebrata Pacifica 1: 109. ♂.

*Paratiphia ormsbyensis* Cameron, 1907. Invertebrata Pacifica 1: 175. ♂.

- Taxonomy: Cameron, 1907. *Invertebrata Pacifica* 1: 172. ♀. — Allen, 1962. *Amer. Ent. Soc., Trans.* 88: 29-30. — Allen, 1965. *Acad. Nat. Sci. Phila., Proc.* 117: 96. ♂. — Allen, 1968. *Amer. Ent. Soc., Trans.* 94: 75, fig. 31, map 7. ♂.
- dreisbachi** Allen. Colo., N. Mex.  
*Paratiphia dreisbachi* Allen, 1968. *Amer. Ent. Soc., Trans.* 94: 83, fig. 32, map 6. ♀.
- ephippiata** Allen. Kans. and Wyo. to Tex. and Ariz. south in Mexico to Zacatecas and San Luis Potosi.  
*Paratiphia ephippata* Allen, 1963. *Ent. Soc. Amer., Ann.* 56: 574, figs. 1, 2 a, b, f. ♂, ♀.
- Taxonomy: Allen, 1965. *Acad. Nat. Sci. Phila., Proc.* 117: 93, fig. 19. ♂, ♀. — Allen, 1968. *Amer. Ent. Soc., Trans.* 94: 50, figs. 6-10, map 3. ♂, ♀.
- fossata** Allen. N. Mex. and Ariz. south in Mexico to Veracruz and Oaxaca.  
*Paratiphia fossata* Allen, 1962. *Ent. News* 73: 259. ♂.
- Taxonomy: Allen, 1965. *Acad. Nat. Sci. Phila., Proc.* 117: 98, 103. ♂. — Allen, 1968. *Amer. Ent. Soc., Trans.* 94: 64, figs. 18-20, map 4. ♂, ♀.
- halli** Allen. Calif. (Riverside Co.).  
*Paratiphia halli* Allen, 1968. *Amer. Ent. Soc., Trans.* 94: 68, map 6. ♂.
- huachucae** Allen. Ariz. (Huachuca Mts.).  
*Paratiphia huachucae* Allen, 1968. *Amer. Ent. Soc., Trans.* 94: 47, map 2. ♂.
- irwini** Allen. Ariz. (Chiricahua Mts.).  
*Paratiphia irwini* Allen, 1968. *Amer. Ent. Soc., Trans.* 94: 74, map 6. ♂.
- knowltoni** Allen. Utah, Nev.  
*Paratiphia knowltoni* Allen, 1968. *Amer. Ent. Soc., Trans.* 94: 82, fig. 35, map 6. ♀.
- knulli** Allen. Tex.  
*Paratiphia knulli* Allen, 1968. *Amer. Ent. Soc., Trans.* 94: 60, fig. 16, map 5. ♂.
- lagosae** Allen. Tex. and Calif. south in Mexico to Michoacan and Hidalgo.  
*Paratiphia lagosae* Allen, 1965. *Acad. Nat. Sci. Phila., Proc.* 117: 101. ♂.
- Taxonomy: Allen, 1968. *Amer. Ent. Soc., Trans.* 94: 37, map 1. ♂, ♀.
- magna** Roberts. Idaho (Pocatello).  
*Paratiphia magna* Roberts, 1929. *Psyche* 36: 358. ♀.
- Taxonomy: Allen, 1968. *Amer. Ent. Soc., Trans.* 94: 84, map 6. ♀.
- mitchelli** Allen. Tex. to Ariz. south in Mexico to Puebla.  
*Paratiphia mitchelli* Allen, 1963. *Amer. Ent. Soc., Trans.* 88: 232, figs. 3, 8, 13, 18. ♂.
- Taxonomy: Allen, 1968. *Amer. Ent. Soc., Trans.* 94: 46, map 2. ♂, ♀.
- neomexicana** Cameron. Oreg. to Nebr. south to Calif. and Tex.; Mexico (Sonora, Chihuahua).  
*Paratiphia neomexicana* Cameron, 1907. *Invertebrata Pacifica* 1: 175. ♂.
- Taxonomy: Allen, 1962. *Amer. Ent. Soc., Trans.* 88: 31 (type redescription). — Allen, 1965. *Acad. Nat. Sci. Phila., Proc.* 117: 94. ♂, ♀. — Allen, 1968. *Amer. Ent. Soc., Trans.* 94: 54, figs. 11, 12, 14, map 4. ♂, ♀.
- nevadensis** Cameron. B. C. to Calif. and Tex., south in Mexico to Baja California and Puebla.  
*Paratiphia nevadensis* Cameron, 1905. *Invertebrata Pacifica* 1: 108. ♂.
- Paratiphia parvula* Cameron, 1907. *Invertebrata Pacifica* 1: 176. ♂.
- Paratiphia intermedia* Cameron, 1907. *Invertebrata Pacifica* 1: 176. ♂.
- Taxonomy: Allen, 1962. *Amer. Ent. Soc., Trans.* 88: 27, 32 (synonymy, type redescription). — Allen, 1963. *Amer. Ent. Soc., Trans.* 88: 229, figs. 4, 9, 14, 17 (redescription). — Allen, 1965. *Acad. Nat. Sci. Phila., Proc.* 117: 91, 95. ♂, ♀. — Allen, 1968. *Amer. Ent. Soc., Trans.* 94: 39, fig. 5, map 2. ♂, ♀.
- occidentalis** Cameron. Nev. (Ormsby Co.).  
*Paratiphia occidentalis* Cameron, 1907. *Invertebrata Pacifica* 1: 173. ♂.
- Taxonomy: Allen, 1968. *Amer. Ent. Soc., Trans.* 94: 108 (type not located).
- robusta** Cameron. B. C., Idaho and Nebr. to Calif. and Tex.; Mexico (Baja California, Nayarit).  
*Paratiphia robusta* Cameron, 1905. *Invertebrata Pacifica* 1: 106. ♀.
- Paratiphia fortistriolata* Cameron, 1907. *Invertebrata Pacifica* 1: 172. ♂.

- Taxonomy: Allen, 1962. Amer. Ent. Soc., Trans. 88: 33 (type redescribed, synonymy). — Allen, 1965. Acad. Nat. Sci. Phila., Proc. 117: 92. ♀, ♂. — Allen, 1968. Amer. Ent. Soc., Trans. 94: 70, figs. 22, 25-30, 41, map 6. ♀, ♂.
- sculleni** Allen. Oreg., Utah, Ariz., N. Mex.  
*Paratiphia sculleni* Allen, 1968. Amer. Ent. Soc., Trans. 94: 52, map 3. ♂, ♀.
- texana** Cameron. Ont. and Mass. to Mont. south to Fla. and Tex.  
*Paratiphia texana* Cameron, 1907. Invertebrata Pacifica 1: 174. ♀, ♂.  
*Paratiphia algonquina* Viereck, 1909. Ent. Soc. Wash., Proc. 11: 45. ♀, ♂.  
*Paratiphia algonquina* (!) Smith, 1910. N. J. State Mus., Ann. Rpt. for 1909, p. 666.
- Taxonomy: Allen, 1962. Amer. Ent. Soc., Trans. 88: 25 (redescription *texana*). — Allen, 1965. Acad. Nat. Sci. Phila., Proc. 117: 97. ♀, ♂. — Allen, 1968. Amer. Ent. Soc., Trans. 94: 62, figs. 15, 17, map 5. ♂, ♀.
- verna** Allen. Calif., Nev., Ariz.; Mexico (Baja California).  
*Paratiphia verna* Allen, 1963. Ent. News 74: 219. ♂, ♀.
- Taxonomy: Allen, 1965. Acad. Nat. Sci. Phila., Proc. 117: 99. ♂. — Allen, 1968. Amer. Ent. Soc., Trans. 94: 80, fig. 36, map 7. ♂, ♀.

## UNPLACED TAXON OF PARATIPHIA SICHEL

- fuscipennis** Cameron. No locality given (title says n. spp. from "Nevada and Southern California").  
*Paratiphia fuscipennis* Cameron, 1905. Invertebrata Pacifica 1: 106. ♀ (in key).

## Genus EPOMIDIOPTERON Romand

- Epomidiopteron* Romand, 1835. Soc. Ent. France, Ann. 4: 653.  
 Type-species: *Epomidiopteron Julii* Romand. Monotypic.
- Scoliphia* Banks, 1912. Canad. Ent. 44: 201.  
 Type-species: *Scoliphia spilota* Banks. Orig. desig.
- Epimodiopteron* (!) Bridwell, 1919. Hawaii. Ent. Soc., Proc. 4: 119.
- julii** Romand. Southern Ariz. to Peru and Argentina.  
*Epomidiopteron Julii* Romand, 1836. Soc. Ent. France, Ann. 4: 653. ♀.  
*Paratiphia 12-maculata* Cameron, 1904. Amer. Ent. Soc., Trans. 30: 94. ♂.  
*Scoliphia spilota* Banks, 1912. Canad. Ent. 44: 201. ♀, ♂.  
*Epimodiopteron* (!) *spilota* Bridwell, 1919. Hawaii. Ent. Soc., Proc. 4: 119.
- Taxonomy: Allen, 1966. Ent. News 77: 206, 2 figs. ♀, ♂ (synonymy and redescription). — Allen, 1972. Smithsn. Contrib. Zool. 113: 3.

## SUBFAMILY MYZININAE

Revision: Krombein, 1938. Amer. Ent. Soc., Trans. 64: 227-292, 12 figs.

## Genus MYZINUM Latreille

- Myzinum* Latreille, 1803. Nouv. Dict. Hist. Nat., v. 15, p. 326.  
 Type-species: *Tiphia maculata* Fabricius. Monotypic.
- Elis* Fabricius, 1805. Systema Piezatorum, p. 248.  
 Type-species: *Elis sexcincta* Fabricius. Desig. by Bingham, 1897.
- Plesia* Jurine, 1807. Nouv. Meth. Class. Hym. Dipt., p. 150.  
 Type-species: *Tiphia namea* Fabricius. Desig. by Ashmead, 1903.
- Myzina* (!) Rafinesque, 1815. Analyse Nat., p. 124.
- In describing *Myzinum* as new, Latreille gave a vernacular as well as a scientific name, thus, *myzine*, *Myzinum*. Later, he and most subsequent authors incorrectly used this vernacular name rather than the properly formed scientific name.
- Two North American species have been recorded as parasitizing scarabaeid larvae in the soil, a host relationship which has been recorded also for several Neotropical species.
- Taxonomy: Pate, 1935. Ent. News 46: 265-267 (nomenclature). — Krombein, 1937. Ent. Soc. Amer., Ann. 30: 26-30 (key to world genera).

*berlyi* *berlyi* (Brimley). S. C., Ill., Ky., Wis., Kans., Miss., Tex.

*Elis berlyi* Brimley, 1927. Ent. News 38: 238. ♀.

Taxonomy: Krombein, 1938. Amer. Ent. Soc., Trans. 64: 249-251. ♀, ♂.

*berlyi parksi* Krombein. La., Tex.

*Myzine* (!) *berlyi parksi* Krombein, 1938. Amer. Ent. Soc., Trans. 64: 251. ♀, ♂.

*berlyi patei* Krombein. N. J., N. C., Ga., Fla.

*Myzine* (!) *berlyi patei* Krombein, 1938. Amer. Ent. Soc., Trans. 64: 254. ♀, ♂.

*carolinianum carolinianum* (Panzer). Va. to Fla., west to Tex.

*Tiphia caroliniana* Panzer, 1806. Krit. Revis. Insektenf. Deutschlands, v. 2, p. i, pl. 1, figs. a-c. ♀.

*Myzine* (!) *flavipes* Olivier, 1811. Encycl. Meth., v. 8, p. 136. ♀.

Taxonomy: Krombein, 1938. Amer. Ent. Soc., Trans. 64: 260-262, fig. 7. ♀, ♂.

*carolinianum collare* (Say). Ohio west to S. Dak., south to La. and N. Mex.

*Meria collaris* Say, 1837. Boston Jour. Nat. Hist. 1: 362. ♀.

*Myzine* (!) *thoracica* Fox, 1893. Canad. Ent. 35: 113. ♀. Preocc.

*Myzine* (!) *illinoisensis* Dalla Torre, 1897. Cat. Hym., v. 8, p. 124. N. name.

*Elis atriventris* Gahan, 1913. U. S. Natl. Mus., Proc. 40: 431. ♀, ♂.

Taxonomy: Krombein, 1938. Amer. Ent. Soc., Trans. 64: 262-265. ♀, ♂.

*confluens* Cresson. Utah, Ariz., south in western Mexico to Oaxaca.

*Myzine* (!) *confluens* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 443. ♀.

Taxonomy: Krombein, 1938. Amer. Ent. Soc., Trans. 64: 287-288. ♀.

*dubiosum* Cresson. D. C. south to Fla., Ala., Ill. south to La., Colo., Ariz., south in Mexico to Veracruz, Sonora and Baja California.

*Myzine* (!) *dubiosa* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 200. ♀.

*Myzine* (!) *texana* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 200. ♀.

*Plesia fulvinervis* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 239. ♀.

Taxonomy: Krombein, 1938. Amer. Ent. Soc., Trans. 64: 281-284, figs. 1, 10. ♀, ♂.

*frontale* Cresson. Kans., Tex., N. Mex., Colo., Ariz., Nev., Calif., south in Mexico to Baja California, Sonora and Chihuahua.

*Plesia marginata* Say, 1823. West. Quart. Rptr. 2: 75. ♀. Preocc.

*Myzine* (!) *frontalis* Cresson, 1875. Rpt. Geog. Geol. Expl. and Survey west of 100th Meridian, p. 711. ♀.

Taxonomy: Krombein, 1938. Amer. Ent. Soc., Trans. 64: 285-287, fig. 9. ♀, ♂.

*maculatum* (Fabricius). Mass. to Fla., west to Nev. and Ariz., Calif. south to Guatemala and El Salvador.

*Tiphia maculata* Fabricius, 1793. Ent. System., p. 224. ♀.

*Sapyga majorta* Panzer, 1806. Krit. Rev. Insektenf. Deutschlands, v. 2, p. iv, pl. 2, figs. d, e. ♂.

*Tiphia interrupta* Say, 1824. In Keating, Narr. Long's 2nd Exped., v. 2, p. 322. ♀.

*Myzine* (!) *hamatus* Say, 1836. Boston Jour. Nat. Hist. 1: 300. ♂.

*Meria costata* Say, 1837. Boston Jour. Nat. Hist. 1: 360. ♀.

*Myzine* (!) *hyalina* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 442. ♂.

*Myzine* (!) *maiorta* (!) Cresson, 1887. Amer. Ent. Soc., Trans., Sup. Vol., p. 268.

*Elis floridanus* Rohwer, 1920. Ent. Soc. Wash., Proc. 22: 54. ♀, ♂.

Taxonomy: Krombein, 1938. Amer. Ent. Soc., Trans. 64: 274-281, fig. 11. ♀, ♂. — Krombein, 1949. U. S. Natl. Mus., Proc. 100: 55-56, figs. 1-3 (gynandromorph).

*marginatum* (Klug). Ga.

*Tiphia marginata* Klug, 1810. In Weber, Beitr. z. Naturk. 2: 184. ♂.

*namea fulviceps* Cameron. South. Ariz. to Guatemala.

*Myzine* (!) *fulviceps* Cameron, 1893. Biol. Cent.-Amer., Hym., v. 2, p. 248, pl. 12, fig. 20. ♀.

*namea namea* (Fabricius). Va., N. C., S. C., Fla., Ala., Tex.

*Tiphia namea* Fabricius, 1805. Systema Piezatorum, p. 233. ♀.

*Elis propodealis* Rohwer, 1920. Ent. Soc. Wash., Proc. 22: 56. ♀.

*Myzine* (!) *magna* Krombein, 1938. Amer. Ent. Soc., Trans. 64: 256. ♂.

Taxonomy: Krombein, 1938. Amer. Ent. Soc., Trans. 64: 256-259, fig. 5. ♂, ♀.

**navajo** Krombein. Ariz. south to El Salvador.

*Myzine* (!) *navajo* Krombein, 1938. Amer. Ent. Soc., Trans. 64: 272. ♀, ♂.

**obscurum** (Fabricius). N. Y. to Fla., west to Ill. and Tex., ? Ariz. Host: *Dyscinetus trachypygus* (Burm.). Parasite: *Dasymutilla mutata* (Bl.).

*Tiphia obscura* Fabricius, 1805. Systema Piezatorum, p. 233. ♀.

*Plesia nigripes* Guérin, 1838. Rev. Zool. 1: 57. ♀.

*Plesia fuliginosa* Lepeletier, 1845. Hist. Nat. Ins. Hym., v. 3, p. 574. ♂.

Taxonomy: Krombein, 1938. Amer. Ent. Soc., Trans. 64: 246-249, fig. 3. ♀, ♂.

**quinquecinctum** (Fabricius). Que. to Fla., west to Wyo. and N. Mex., Calif.; Mexico (Coahuila).

Host: *Phyllophaga* spp. Parasite: *Dasymutilla quadriguttata* (Say).

*Tiphia 5-cincta* Fabricius, 1775. Systema Ent., p. 353. ♀.

*Tiphia cingulata* Klug, 1810. In Weber, Beitr. z. Naturk. 2: 185. ♂.

*Sappya subulata* Say, 1823. West. Quart. Rptr. 2: 75. ♂.

*Myzine* (!) *proxima* Guérin, 1837. Dict. Pitt. Hist. Nat., p. 581. ♂.

Taxonomy: Krombein, 1938. Amer. Ent. Soc., Trans. 64: 265-272, fig. 6. ♀, ♂. —Evans, 1965. Ent. Soc. Wash., Proc. 67: 92, figs. 11-14 (larva).

Biology: Flint and Sanders, 1912. Jour. Econ. Ent. 3: 490. —Davis, 1919. Ill. Nat. Hist. Survey, Bul. 13: 73.

Morphology: Snodgrass, 1941. Smithsn. Inst., Misc. Collect. 99, no. 14, p. 44, pl. 14, figs. M-S (male genitalia).

**serenum** (Fabricius). S. C.

*Tiphia serena* Fabricius, 1805. Systema Piezatorum, p. 234. ♀.

**spilonotum** (Cameron). Tex., N. Mex., Colo., Utah, Ariz., south in western Mexico to Oaxaca.

*Plesia spilonota* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 240. ♀.

Taxonomy: Krombein, 1938. Amer. Ent. Soc., Trans. 64: 288-290, fig. 12. ♀, ♂.

### Genus PTEROMBRUS Smith

*Pterombrus* Smith, 1869. Ent. Soc. London, Trans., p. 302.

Type-species: *Pterombrus aenigmaticus* Smith. Monotypic.

*Enggystis* Fox, 1895. Calif. Acad. Sci., Proc. 4: 262.

Type-species: *Myzine* (!) *rufiventris* Cresson. Monotypic.

*Huberia* Ducke, 1907. Rev. d'Ent. 26: 5.

Type-species: *Huberia glabricollis* Ducke. Desig. by Krombein, 1937.

*Pterombrus* (!) Williams, 1928. Hawaii. Sugar Planters' Assoc. Expt. Sta., Bul. Ent. Ser. 19: 144.

Nothing is known of the habits of our sole North American species, but some of the South American species are parasitic on larvae of two genera of Cicindelidae (Coleoptera).

**rufiventris hyalinatus** Krombein. West. Tex., Ariz., Calif.

*Pterombrus rufiventris hyalinatus* Krombein, 1949. Pan-Pacific Ent. 25: 88. ♀, ♂.

**rufiventris rufiventris** (Cresson). Va. south to Ga. to east. Tex.

*Myzine rufiventris* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 201. ♂.

*Myzine cressonii* Dalla Torre, 1897. Cat. Hym., v. 8, p. 122. N. name for *Myzine rufiventris* Cresson, not *Meria rufiventris* Klug.

Taxonomy: Krombein, 1938. Amer. Ent. Soc., Trans. 64: 236-238, fig. 2. ♀, ♂. —Krombein, 1949. Pan-Pacific Ent. 25: 88.

### SUBFAMILY ANTHOBOSCINAE

*Lalapa* Pate, 1947. N. Y. Ent. Soc., Jour. 55: 126.

Type-species: *Lalapa lusa* Pate. Orig. desig.

lusa Pate. Idaho, Wash. to Calif.

*Lalapa lusa* Pate, 1947. N. Y. Ent. Soc., Jour. 55: 128. ♀, ♂.

#### SUBFAMILY BRACHYCISTIDINAE

Brachycistidinae exhibit very pronounced sexual dimorphism, males being fully winged and females wingless and with modified thorax. Positive sex associations have been established only in *Brachycistis* Fox. Eventually there will be considerable generic synonymy because the remaining males and females are assigned to separate genera.

Revision: Bradley, 1917. Amer. Ent. Soc., Trans. 43: 252-283, pls. 20-25 (males only).

—Malloch, 1926. U. S. Natl. Mus., Proc. 68 (3): 1-28, pls. 1-4 (males only). —Mickel and

Krombein, 1942. Amer. Midland Nat. 28: 648-679, pls. 1-3 (females only).

Taxonomy: Wasbauer, 1966. Calif. Univ. Pubs. Ent. 43: 15 (key to male genera). —Wasbauer, 1968. Pan-Pacific Ent. 44: 196-197 (key to male genera).

Biology: Rozen, 1952. Pan-Pacific Ent. 23: 91-92 (collecting techniques for females).

#### Genus BRACHYCISTIS Fox

*Brachycistis* Fox, 1893. Calif. Acad. Sci., Proc. 4 (ser. 2): 7.

Type-species: *Brachycistis petiolatus* Fox. Orig. desig.

*Brachycistis* (!) Cockerell and Casad, 1894. Ent. News 5: 295.

*Glyptometopa* Ashmead, 1898. Psyche 8: 251.

Type-species: *Glyptometopa americana* Ashmead. Orig. desig.

*Glyptometopa* (!) Fox, 1899. Amer. Ent. Soc., Trans. 25: 289.

*Brachycistis* (!) Viereck, 1906. Amer. Ent. Soc., Trans. 32: 190.

*Stilbopogon* Mickel and Krombein, 1942. Amer. Midland Nat. 28: 658.

Type-species: *Stilbopogon alutacea* Mickel and Krombein. Orig. desig.

*Astigmometopa* Mickel and Krombein, 1942. Amer. Midland Nat. 28: 668.

Type-species: *Astigmometopa emarginata* Mickel and Krombein. Orig. desig.

Revision: Wasbauer, 1966. Univ. Calif. Pubs. Ent. 43: 1-96, 144 figs., 21 maps (males).

Taxonomy: Wasbauer, 1969 (1968). Pan-Pacific Ent. 44: 297-298 (sex association).

—Wasbauer, 1971. Pan-Pacific Ent. 47: 211-212 (sex association).

#### SPECIES GROUP NITIDA

Taxonomy: Wasbauer, 1966. Univ. Calif. Pubs. Ent. 43: 20.

*arenivaga* Bradley. Sonoran desert of Calif. and Ariz.; Mexico (Baja California, Sonora).

*Brachycistis* (*Brachycistis*) *arenivaga* Bradley, 1917. Amer. Ent. Soc., Trans. 43: 269. ♂.

*Brachycistis* (*Brachycistis*) *eriopis* Bradley, 1917. Amer. Ent. Soc., Trans. 43: 266. ♂.

Taxonomy: Wasbauer, 1966. Univ. Calif. Pubs. Ent. 43: 20-21, figs. 23, 40, 95, 96, map 1. ♂.

*linsleyi* Wasbauer. Mojave, Sonoran and Chihuahuan deserts, Calif., Nev., Ariz., N. Mex. and Tex.; Mexico (Baja California, Chihuahua).

*Brachycistis linsleyi* Wasbauer, 1966. Univ. Calif. Pubs. Ent. 43: 21, figs. 16, 17, 41, 97, 98, map 2. ♂.

*nitida* (Cresson). Great Basin and Rocky Mt. grasslands, Nebr., Kans., Tex., Mont., Utah, N. Mex., Ariz.

*Agama nitida* Cresson, 1875. Rpt. Geog. Geol. Expl. and Survey west of 100th Meridian, p. 710. ♂.

*Photopsis sobrinus* Blake, 1886. Amer. Ent. Soc., Trans. 13: 268. ♂.

*Photopsis lepidus* Blake, 1886. Amer. Ent. Soc., Trans. 13: 269. ♂.

Taxonomy: Wasbauer, 1966. Univ. Calif. Pubs. Ent. 43: 23-25, figs. 43, 44, 99, 100, map 3. ♂.

*texana* Malloch. Chihuahuan desert of Tex.; Mexico (Coahuila, Nuevo Leon).

*Brachycistis* (*Brachycistis*) *texana* Malloch, 1926. U. S. Natl. Mus., Proc. 68 (3): 12. ♂.

Taxonomy: Wasbauer, 1966. Univ. Calif. Pubs. Ent. 43: 25-27, figs. 18, 19, 45, 46, 91, 101, 102, map 5 (not 4). ♂.



**verticalis** Malloch. Sonoran desert of Ariz.; Mexico (Sonora).

*Brachycistis (Brachycistis) verticalis* Malloch, 1926. U. S. Natl. Mus., Proc. 68 (3): 19. ♂.

Taxonomy: Wasbauer, 1966. Univ. Calif. Pubs. Ent. 43: 27-30, map 4 (not 5). ♂.

#### SPECIES GROUP PETIOLATA

Taxonomy: Wasbauer, 1966. Univ. Calif. Pubs. Ent. 43: 30-31.

**elegantula** Cockerell and Casad. Southern Mojave, Sonoran and Chihuahuan deserts of Calif., Ariz., N. Mex. and Tex.; Mexico (Baja California, Sonora).

*Brachycistis (!) elegantula* Cockerell and Casad, 1894. Ent. News 5: 295. ♂.

Taxonomy: Wasbauer, 1966. Univ. Calif. Pubs. Ent. 43: 31-33, figs. 35, 47, 48, 103, 104, map 6. ♂.

**imitans** Malloch. Central Valley, Mojave and Sonoran deserts of Calif., Ariz.; Mexico (Baja California).

*Brachycistis (Brachycistis) imitans* Malloch, 1926. U. S. Natl. Mus., Proc. 68 (3): 23. ♂.

Taxonomy: Wasbauer, 1966. Univ. Calif. Pubs. Ent. 43: 33-35, figs. 39, 49, 50, 92, 105, 106, map 7. ♂. — Wasbauer, 1969 (1968). Pan-Pacific Ent. 44: 298-299. ♀.

**juncea** Wasbauer. Calif. (San Bernardino Co.).

*Brachycistis juncea* Wasbauer, 1966. Univ. Calif. Pubs., Ent. 43: 35, figs. 36, 51, 52, 107, 108. ♂.

**lacustris hurdi** Wasbauer. Sonoran desert of Calif., Ariz., ? Tex.

*Brachycistis lacustris hurdi* Wasbauer, 1966. Univ. Calif. Pubs., Ent. 43: 38, map 8. ♂.

**lacustris lacustris** Malloch. Mojave desert of Calif., Nev.

*Brachycistis (Brachycistis) lacustris* Malloch, 1926. U. S. Natl. Mus., Proc. 68 (3): 24. ♂.

Taxonomy: Wasbauer, 1966. Univ. Calif. Pubs. Ent. 43: 37, map 8. ♂.

**longula** Wasbauer. Calif. (Riverside Co.).

*Brachycistis longula* Wasbauer, 1966. Univ. Calif. Pubs. Ent. 43: 39, figs. 37, 55, 56, 111, 112. ♂.

**petiolata** Fox. Mojave and Sonoran deserts of Calif., Nev., Ariz., also Utah, Idaho; Mexico (Baja California, Sonora).

*Brachycistis petiolata* Fox, 1893. Calif. Acad. Sci., Proc. (2) 4: 8. ♂.

*Brachycistis gaudii* Cockerell, 1901. Canad. Ent. 33: 340. ♂.

*Brachycistis (Brachycistis) parva* Malloch, 1926. U. S. Natl. Mus., Proc. 68 (3): 14. ♂.

Taxonomy: Wasbauer, 1966. Univ. Calif. Pubs. Ent. 43: 40-42, figs. 8, 27, 57, 58, 113, 114, map 9. ♂.

#### SPECIES GROUP ATRATA

Taxonomy: Wasbauer, 1966. Univ. Calif. Pubs. Ent. 43: 43.

**alcanor** (Blake). Alta., Mont. and S. Dak. south to Ariz. and Tex.; Mexico (Chihuahua, Coahuila, Durango, Jalisco, Mexico, Puebla, Zacatecas).

*Agama Alcanor* Blake, 1871. Amer. Ent. Soc., Trans. 3: 264. ♂.

*Brachycistis cremastogaster* Melander, 1903. Amer. Ent. Soc., Trans. 29: 329. ♂.

*Brachycistis crematogaster (!)* Krombein, 1951. U. S. Dept. Agr., Monog. 2: 743.

Taxonomy: Wasbauer, 1966. Univ. Calif. Pubs. Ent. 43: 46-48, 75, figs. 30, 61, 62, 117, 118, map 11. ♂.

**ampla** (Blake). Colo., Ariz., Nev., Calif., Wash.

*Agama ampla* Blake, 1879. Amer. Ent. Soc., Trans. 7: 252. ♂.

Taxonomy: Wasbauer, 1966. Univ. Calif. Pubs. Ent. 43: 48, figs. 63, 64, 119, 120, map 12. ♂.

**atrata** (Blake). B. C., Wash. and Idaho south to Calif. and Ariz.; Mexico (Baja California, Sonora).

*Agama atrata* Blake, 1879. Amer. Ent. Soc., Trans. 7: 253. ♂.

*Mutilla agama* Dalla Torre, 1897. Cat. Hym., v. 8, p. 7. N. name for *Agama atrata* Blake, not *Mutilla atrata* Linnaeus.

*Brachycistis nudus* Fox, 1899. Amer. Ent. Soc., Trans. 25: 281. ♂.

*Brachycistis nigratus* Fox, 1899. Amer. Ent. Soc., Trans. 25: 282. ♂.

- Brachycistis contiguus* Fox, 1899. Amer. Ent. Soc., Trans. 25: 282. ♂.  
*Glyptometopa francisca* Mickel and Krombein, 1942. Amer. Midland Nat. 28: 656. ♀.
- Taxonomy:** Wasbauer, 1966. Univ. Calif. Pubs. Ent. 43: 43-46, figs. 6, 21, 34, 59, 60, 89, 115, 116, map 10. ♂. —Wasbauer, 1969 (1968). Pan-Pacific Ent. 44: 297-298 (female synonymy).
- carinata** Fox. South, Calif. coastal mts.; Mexico (Baja California).  
*Brachycistis carinatus* Fox, 1899. Amer. Ent. Soc., Trans. 25: 283. ♂.
- Taxonomy:** Wasbauer, 1966. Univ. Calif. Pubs. Ent. 43: 49-51, figs. 20, 65, 121, 122, map 13. ♂. —Wasbauer, 1971. Pan-Pacific Ent. 47: 212. ♀.
- convexa** Wasbauer. Calif. (Imperial Co.).  
*Brachycistis convexa* Wasbauer, 1966. Univ. Calif. Pubs. Ent. 43: 51, figs. 31, 66, 67, 94, 123, 124. ♂.
- cruenta** Wasbauer. Tex. (Nueces Co.); Mexico (Tamaulipas).  
*Brachycistis cruenta* Wasbauer, 1966. Univ. Calif. Pubs. Ent. 43: 53, figs. 68, 69, 125, 126. ♂.
- curvata** Malloch. Sonoran desert of Calif., Ariz.; Mexico (Baja California).  
*Brachycistis (Brachycistis) curvata* Malloch, 1926. U. S. Natl. Mus., Proc. 68 (3): 16. ♂.
- Taxonomy:** Wasbauer, 1966. Univ. Calif. Pubs. Ent. 43: 54-56, figs. 70, 71, 127, 128, map 14. ♂.
- davidi** Wasbauer. Tex.; Mexico (Coahuila).  
*Brachycistis davidi* Wasbauer, 1966. Univ. Calif. Pubs. Ent. 43: 56, figs. 22, 32, 72, 73, 129, 130. ♂.
- glabrella** (Cresson). Alta., Oreg., Idaho, Wyo. and Nebr. to Calif. and Tex., south in Mexico to Oaxaca.  
*Mutilla glabrella* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 441. ♂.  
*Brachycistis (Brachycistis) dentata* Bradley, 1917. Amer. Ent. Soc., Trans. 43: 263. ♂.  
*Brachycistis (Brachycistis) micrommata* Bradley, 1917. Amer. Ent. Soc., Trans. 43: 265. ♂.  
*Brachycistis (Brachycistis) utahensis* Malloch, 1926. U. S. Natl. Mus., Proc. 68 (3): 17. ♂.  
*Brachycistis (Brachycistis) melanocephala* Malloch, 1926. U. S. Natl. Mus., Proc. 68 (3): 19. ♂.  
*Brachycistis (Brachycistis) dakotensis* Malloch, 1926. U. S. Natl. Mus., Proc. 68 (3): 20. ♂.
- Taxonomy:** Wasbauer, 1966. Univ. Calif. Pubs. Ent. 43: 57-59, figs. 25, 33, 74, 75, 131, 132, map 15. ♂.
- inaequalis** Fox. South, Calif., Nev., Ariz. and Tex.; Mexico (Baja California).  
*Brachycistis inaequalis* Fox, 1899. Amer. Ent. Soc., Trans. 25: 282. ♂.  
*Brachycistis nevadensis* Fox, 1899. Amer. Ent. Soc., Trans. 25: 283. ♂.  
*Brachycistis nocticola* Bradley, 1917. Amer. Ent. Soc., Trans. 43: 289, figs. 19, 39, 40. ♂.
- Taxonomy:** Krombein, 1954. Ent. Soc. Wash., Proc. 56: 85-86 (synonymy of *nocticola*).  
 —Wasbauer, 1966. Univ. Calif. Pubs. Ent. 43: 59-61, figs. 29, 76, 77, 133, 134, map 16. ♂.
- indiscreta** Fox. Nebr. to Tex., N. Mex., Ariz.; Mexico (Chihuahua).  
*Brachycistis indiscreta* Fox, 1899. Amer. Ent. Soc., Trans. 25: 284. ♂.  
*Brachycystis (!) stictinotus* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 190. ♂.
- Taxonomy:** Wasbauer, 1966. Univ. Calif. Pubs. Ent. 43: 61-63, figs. 26, 38, 78, 135, 136, map 17. ♂.
- ioachinensis** Bradley. Wash. and Mont. to Calif. and Tex. south in Mexico to Baja California and Sonora.  
*Brachycistis (Brachycistis) ioachinensis* Bradley, 1917. Amer. Ent. Soc., Trans. 43: 267. ♂.  
*Brachycistis (Brachycistis) rugosa* Malloch, 1926. U. S. Natl. Mus., Proc. 68 (3): 11. ♂.  
*Brachycistis (Brachycistis) subcarinata* Malloch, 1926. U. S. Natl. Mus., Proc. 68(3): 11. ♂.  
*Brachycistis (Brachycistis) nigrifrons* Malloch, 1926. U. S. Natl. Mus., Proc. 68 (3): 16. ♂.  
*Brachycistis (Brachycistis) washingtona* Malloch, 1926. U. S. Natl. Mus., Proc. 68 (3): 21. ♂.
- Taxonomy:** Wasbauer, 1966. Univ. Calif. Pubs. Ent. 43: 65-68, figs. 1, 12, 13, 79, 80, 137, 138, map 18. ♂.

**semiatra** Malloch. Wash. to northeast. Calif., to Idaho and Utah.

*Brachycistis (Brachycistis) semiatra* Malloch, 1926. U. S. Natl. Mus., Proc. 68 (3): 24. ♂.

Taxonomy: Wasbauer, 1966. Univ. Calif. Pubs. Ent. 43: 68-70, figs. 81, 82, 139, 140, map 19. ♂.

**subquadrata** Fox. Calif. (San Diego Co.).

*Brachycistis subquadratus* Fox, 1899. Amer. Ent. Soc., Trans. 25: 282. ♂.

*Brachycistis (Brachycistis) intermedia* Malloch, 1926. U. S. Natl. Mus., Proc. 68 (3): 18. ♂.

Taxonomy: Wasbauer, 1966. Univ. Calif. Pubs. Ent. 43: 64-65. ♂.

**timberlakei** Wasbauer. Calif., Nev., Utah, Ariz., N. Mex., Tex.

*Brachycistis timberlakei* Wasbauer, 1966. Univ. Calif. Pubs. Ent. 43: 70, figs. 90, 141, 142, map 20. ♂.

**triangularis** Fox. South. Calif., Nev., Ariz., N. Mex., Tex.; Mexico (Baja California, Sonora, Chihuahua, Durango).

*Brachycistis triangularis* Fox, 1899. Amer. Ent. Soc., Trans. 25: 284. ♂.

Taxonomy: Wasbauer, 1966. Univ. Calif. Pubs. Ent. 43: 72-73, figs. 24, 83, 84, 93, 143, 144, map 21. ♂.

#### UNPLACED TAXA OF BRACHYCISTIS FOX

**alutacea** (Mickel and Krombein). Tex., N. Mex.

*Stilbopogon alutacea* Mickel and Krombein, 1942. Amer. Midland Nat. 28: 659. ♀.

**americana** (Ashmead). Calif. (Alameda Co.).

*Glyptometopa americana* Ashmead, 1898. Psyche 8: 251. ♀.

**convergens** (Mickel and Krombein). Calif. (Santa Monica).

*Glyptometopa convergens* Mickel and Krombein, 1942. Amer. Midland Nat. 28: 657. ♀.

**emarginata** (Mickel and Krombein). Tex. (Valentine).

*Astigmometopa emarginata* Mickel and Krombein, 1942. Amer. Midland Nat. 28: 668. ♀.

Taxonomy: Wasbauer, 1971. Pan-Pacific Ent. 47: 212.

**protracta** Bradley. Ariz. (Phoenix).

*Brachycistis (Brachycistis) protracta* Bradley, 1917. Amer. Ent. Soc., Trans. 43: 270. ♂.

*Brachycistis (Brachycistis) protractor* (!) Malloch, 1926. U. S. Natl. Mus., Proc. 68 (3): 7.

Taxonomy: Wasbauer, 1966. Univ. Calif. Pubs. Ent. 43: 74. ♂.

#### Genus COLOCISTIS Krombein

*Colocistis* Krombein, 1942. Ent. Soc. Wash., Proc. 44: 65.

Type-species: *Colocistis pilosa* Krombein. Orig. desig.

Taxonomy: Wasbauer, 1968. Pan-Pacific Ent. 44: 197, figs. 21, 23.

**brevis** (Fox). Ariz., Nev., Calif.

*Brachycistis brevis* Fox, 1899. Amer. Ent. Soc., Trans. 25: 285. ♂.

**castanea** (Cresson). Tex., N. Mex., Colo., Ariz., Nev., Calif.

*Mutilla castanea* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 388. ♂.

**crassa** (Bradley). Tex., Colo., Ariz., Nev., Calif.

*Brachycistis (Brachycistis) crassa* Bradley, 1917. Amer. Ent. Soc., Trans. 43: 277. ♂.

**eremi** (Bradley). Ariz., Nev., Calif.

*Brachycistis (Brachycistis) eremi* Bradley, 1917. Amer. Ent. Soc., Trans. 43: 279. ♂.

**pilosa** Krombein. Calif. (San Diego).

*Colocistis pilosa* Krombein, 1942. Ent. Soc. Wash., Proc. 44: 66. ♂.

**stygia** (Bradley). Ariz. (Nogales).

*Brachycistis (Brachycistis) stygia* Bradley, 1917. Amer. Ent. Soc., Trans. 43: 276. ♂.

**thermarum** (Bradley). Ariz.

*Brachycistis (Brachycistis) thermarum* Bradley, 1917. Amer. Ent. Soc., Trans. 43: 274. ♂.

#### Genus ACANTHETROPIS Wasbauer

*Acanthetropis* Wasbauer, 1958. Pan-Pacific Ent. 34: 139.

Type-species: *Acanthetropis lamellatus* Wasbauer. Orig. desig.

Taxonomy: Wasbauer, 1968. Pan-Pacific Ent. 44: 197, figs. 20, 24.

*aequalis* (Fox). Nebr., Kans., Colo., Idaho, Nev., Ariz.

*Brachycistis aequalis* Fox, 1899. Amer. Ent. Soc., Trans. 25: 284. ♂.

*idiotes* (Cockerell). N. Mex., Calif.

*Brachycistis idiotes* Cockerell, 1895. Ent. News. 6: 63. ♂.

*noctivaga* (Bradley). Utah, Nev., Ariz., Calif.; Mexico (Sonora, Baja California).

*Brachycistis (Brachycistis) noctivaga* Bradley, 1917. Amer. Ent. Soc., Trans. 43: 272. ♂.

*normalis* (Malloch). S. Dak., Colo., Ariz., Calif.

*Brachycistis normalis* Malloch, 1926. U. S. Natl. Mus., Proc. 68 (3): 8. ♂.

### Genus BRACHYCISTINA Malloch

*Brachycistis* subg. *Brachycistina* Malloch, 1926. U. S. Natl. Mus., Proc. 68 (3): 5, 25.

Type-species: *Brachycistis (Brachycistina) acuta* Malloch. Orig. desig.

Taxonomy: Wasbauer, 1968. Pan-Pacific Ent. 44: 197, fig. 25.

*acuta* (Malloch). Ariz., Nev., Calif.

*Brachycistis (Brachycistina) acuta* Malloch, 1926. U. S. Natl. Mus., Proc. 68 (3): 25. ♂.

### Genus HADROCISTIS Wasbauer

*Hadrocistis* Wasbauer, 1968. Pan-Pacific Ent. 44: 185.

Type-species: *Hadrocistis bicolor* Wasbauer. Orig. desig.

*bicolor* Wasbauer. Calif. (Imperial Co.).

*Hadrocistis bicolor* Wasbauer, 1968. Pan-Pacific Ent. 44: 187, figs. 4-6, 14, 18. ♂.

*slanskyae* Wasbauer. Calif. (Imperial Co.).

*Hadrocistis slanskyae* Wasbauer, 1968. Pan-Pacific Ent. 44: 188, figs. 1-3, 13, 17. ♂.

### Genus BRACHYCISTELLUS Baker

*Brachycistellus* Baker, 1907. Invertebrata Pacifica 1: 177.

Type-species: *Brachycistellus figitiformis* Baker. Monotypic.

Taxonomy: Wasbauer, 1968. Pan-Pacific Ent. 44: 193-195.

*figitiformis* Baker. Calif. (Colusa Co., Claremont).

*Brachycistellus figitiformis* Baker, 1907. Invertebrata Pacifica 1: 178. ♂.

Taxonomy: Wasbauer, 1968. Pan-Pacific Ent. 44: 195-196, figs. 10-12, 16, 19. ♂.

### Genus QUEMAYA Pate

*Quemaya* Pate, 1947. N. Y. Ent. Soc., Jour. 55: 139.

Type-species: *Brachycistis (Brachycistellus) paupercula* Bradley. Orig. desig.

Taxonomy: Wasbauer, 1968. Pan-Pacific Ent. 44: 196, fig. 22.

*arenicola* Wasbauer. Calif. (Imperial Co.).

*Quemaya arenicola* Wasbauer, 1967. Biol. Soc. Wash., Proc. 80: 169, figs. 2-6. ♂.

*inermis* (Malloch). Ariz. (Higley).

*Brachycistis* (!) (*Brachycistellus*) *inermis* Malloch, 1924. Brooklyn Ent. Soc., Bul. 19: 23. ♂.

*marcida* (Bradley). Calif. (Calexico).

*Brachycistis (Brachycistellus) marcida* Bradley, 1917. Amer. Ent. Soc., Trans. 43: 283. ♂.

*paupercula* (Bradley). Calif., Nev.

*Brachycistis (Brachycistellus) paupercula* Bradley, 1917. Amer. Ent. Soc., Trans. 43: 282. ♂.

*perpunctata* (Cockerell). N. Mex., Calif.

*Brachycistis perpunctatus* Cockerell, 1896. Amer. Ent. Soc., Trans. 22: 291. ♂.

Taxonomy: Wasbauer, 1968. Biol. Soc. Wash., Proc. 80: 170, fig. 1.

**Genus GLYPTACROS Mickel and Krombein**

*Glyptacros* Mickel and Krombein, 1942. Amer. Midland Nat. 28: 660.

Type-species: *Glyptacros angustior* Mickel and Krombein. Orig. desig.

*angustior* Mickel and Krombein. Ariz.

*Glyptacros angustior* Mickel and Krombein, 1942. Amer. Midland Nat. 28: 660. ♀.

*ashmeadi* Mickel and Krombein. No locality given.

*Glyptacros ashmeadi* Mickel and Krombein, 1942. Amer. Midland Nat. 28: 661. ♀.

**Genus XEROGLYPTA Mickel and Krombein**

*Xeroglypta* Mickel and Krombein, 1942. Amer. Midland Nat. 28: 663.

Type-species: *Xeroglypta egregia* Mickel and Krombein. Orig. desig.

*egregia* Mickel and Krombein. Calif. (Palm Springs).

*Xeroglypta egregia* Mickel and Krombein, 1942. Amer. Midland Nat. 28: 663. ♀.

**Genus AULACROS Mickel and Krombein**

*Aulacros* Mickel and Krombein, 1942. Amer. Midland Nat. 28: 664.

Type-species: *Aulacros latior* Mickel and Krombein. Orig. desig.

*latior* Mickel and Krombein. Calif. (Palm Springs).

*Aulacros latior* Mickel and Krombein, 1942. Amer. Midland Nat. 28: 665. ♀.

**Genus BRUESIELLA Mann**

*Bruesiella* Mann, 1914. Psyche 21: 182.

Type-species: *Bruesiella formicaria* Mann. Orig. desig.

*Euryeros* Mickel and Krombein, 1942. Amer. Midland Nat. 28: 666.

Type-species: *Euryeros furtivus* Mickel and Krombein. Orig. desig.

Taxonomy: Krombein, 1967. U. S. Dept. Agr., Monog. 2, Sup. 2: 325 (synonymy).

*furtivus* (Mickel and Krombein). Ariz. (Tucson, Avondale Ranch).

*Euryeros furtivus* Mickel and Krombein, 1942. Amer. Midland Nat. 28: 667. ♀.

**Genus AGLYPTACROS Mickel and Krombein**

*Aglyptacros* Mickel and Krombein, 1942. Amer. Midland Nat. 28: 669.

Type-species: *Glyptometopa eureka* Banks. Orig. desig.

*eureka* (Banks). Ariz. (Palmerlee).

*Glyptometopa eureka* Banks, 1912. Canad. Ent. 44: 202. ♀.

*paxillatus* Mickel and Krombein. Colo. (La Junta).

*Aglyptacros paxillatus* Mickel and Krombein, 1942. Amer. Midland Nat. 28: 673. ♀.

*segredentatus* Mickel and Krombein. Ariz. (Benson).

*Aglyptacros segredentatus* Mickel and Krombein, 1942. Amer. Midland Nat. 28: 671. ♀.

*sulcatus* Mickel and Krombein. Tex. (Valentine).

*Aglyptacros sulcatus* Mickel and Krombein, 1942. Amer. Midland Nat. 28: 674. ♀.

**SUBFAMILY METHOCHINAE****Genus METHOCHA Latreille****Genus METHOCHA Subgenus METHOCHA Latreille**

*Methocha* Latreille, 1804. Nouv. Dict. Hist. Nat., v. 24, p. 179.

Type-species: *Mutilla articulata* Latreille. Monotypic.

*Methoca* (!) Latreille, 1804. Hist. Nat. Crust. Ins., v. 13, p. 268.

*Tengyra* Latreille, 1809. Gen. Crust. Ins., v. 4, p. 115.

Type-species: *Tengyra Sanvitali* Latreille. Monotypic.

*Spinolia* Costa, 1858. Fauna Napoli Scol., p. 21.

Type-species: *Spinolia italica* Costa. Monotypic.

Two of our native species have been reared from larvae of tiger beetles, the known host of several extralimital species.

Only the typical subgenus occurs in North America.

Morphology: Reid, 1941. Roy. Ent. Soc. London, Trans. 91: 389-390, figs. 26-28 (female, male thorax).

**californica** Westwood. Calif., Nev., Wash. Host: *Cicindela senilis* Horn ?; cicindelid sp.; reared in laboratory on *Onus californicus* Esch.

*Methoca* (!) *californica* Westwood, 1881. Ent. Soc. London, Trans., p. 133. ♀.

*Methoca* (!) *nigrior* Fox, 1899. Amer. Ent. Soc., Trans. 25: 288. ♂.

Biology: Bridwell, 1912. Pacific Coast Ent. Soc., Proc. 1: 46-48 (host). — Burdick and Wasbauer, 1959. Wasmann Jour. Biol. 17: 75-88, 6 figs. (prey capture, oviposition, life history, egg, larva).

**formosa** Krombein. Fla. (Arcadia).

*Methocha* (*Methocha*) *formosa* Krombein, 1954. Amer. Ent. Soc., Trans. 80: 2, figs. 1, 3. ♀.

**impolita** Krombein. W. Va., D. C., N. Y.

*Methocha* (*Methocha*) *impolita* Krombein, 1958. Ent. Soc. Wash., Proc. 60: 58. ♀.

**stygia** (Say). General in south. Canada and U. S. Host: Cicindelid larvae.

*Mutilla* (*Methoca* (!)) *pacalis* Harris, 1835. In Hitchcock, Rpt. Geol. Mineral. Bot. Zool. Mass., p. 587. Nom. nud.

*Tengyra stygia* Say, 1836. Boston Jour. Nat. Hist. 1: 299. ♂.

*Methoca* (!) *bicolor* Say, 1836. Boston Jour. Nat. Hist. 1: 299. ♀.

*Methoca* (!) *canadensis* Smith, 1855. Cat. Hym. Brit. Mus., v. 3, p. 67. ♂.

Taxonomy: Evans, 1965. Ent. Soc. Wash., Proc. 67: 88-90, figs. 1-5 (larva).

Biology: Williams, 1916. Psyche 23: 121-125, pl. 12.

#### SUBFAMILY MYRMOSINAE

The Myrmosinae have as hosts the larvae of small ground-nesting wasps and bees.

Brothers (1975) transferred this subfamily to the Mutillidae.

Revision: Krombein, 1940. Amer. Ent. Soc., Trans. 65: 415-465, pl. 24.

Taxonomy: Wasbauer, 1974 (1973). Pan-Pacific Ent. 49: 335 (key to female genera).

#### Genus MYRMOSA Latreille

##### Genus MYRMOSA Subgenus MYRMOSA Latreille

*Myrmosa* Latreille, 1796. Precis Caract. Gen. Ins., p. 118.

Type-species: *Myrmosa atra* Panzer. First included species.

*Ischioceras* Provancher, 1882. Nat. Canad. 13: 8.

Type-species: *Ischioceras rugosa* Provancher. First included species.

Morphology: Reid, 1941. Roy. Ent. Soc. London, Trans. 91: 384-385, figs. 11-14 (female, male thorax).

**blakei** Bradley. N. Y., Va.

*Myrmosa* (*Myrmosa*) *blakei* Bradley, 1917. Amer. Ent. Soc., Trans. 43: 251. ♀.

Taxonomy: Krombein, 1940. Amer. Ent. Soc., Trans. 65: 438. ♀.

**bradleyi** Roberts. Wash., Calif.

*Myrmosa bradleyi* Roberts, 1929. Psyche 36: 362. ♂.

Taxonomy: Krombein, 1940. Amer. Ent. Soc., Trans. 65: 436-438, fig. 2. ♂, ♀.

Biology: Linsley, 1960. Pan-Pacific Ent. 36: 36 (mating behavior).

**peculiaris** Krombein. Kans. (Onaga).

*Myrmosa* (*Myrmosa*) *peculiaris* Krombein, 1940. Amer. Ent. Soc., Trans. 65: 438. ♀.

**unicolor** Say. N. B. south to N. C., west to B. C. and Ariz. Host: *Tiphia* sp.; *Lindenius columbianus errans* (Fox) ?; *Dialictus pruinosus* (Robt.); *D. inconspicuus* (Sm.).

*Myrmosa unicolor* Say, 1824. In Keating, Narr. Long's 2nd. Exped., v. 2, p. 331. ♂.

- Ischioceras rugosa* Provancher, 1882. Nat. Canad. 13: 8. ♀, (♂ misdet.).  
*Mutilla thoracica* Blake, 1886. Amer. Ent. Soc., Trans. 13: 204. Preocc.  
*Mutilla erythronota* Dalla Torre, 1897. Cat. Hym., v. 8, p. 36. N. name.  
*Myrmosa* (*Myrmosa*) *banksi* Bradley, 1917. Amer. Ent. Soc., Trans. 43: 249. ♀, ♂.  
*Myrmosa dakotensis* Weber, 1934. Psyche 41: 57. ♀.

Taxonomy: Krombein, 1940. Amer. Ent. Soc., Trans. 65: 430-436, fig. 6.

Biology: Melander and Brues, 1903. Biol. Bul. 5: 7. — Krombein, 1940. Amer. Ent. Soc., Trans. 65: 435-436. — Krombein, 1956. Ent. Soc. Wash., Proc. 58: 154 (mating behavior).

#### Genus MYRMOSA Subgenus MYRMOSINA Krombein

*Myrmosa* subg. *Myrmosina* Krombein, 1940. Amer. Ent. Soc., Trans. 65: 452.

Type-species: *Myrmosa* (*Myrmosina*) *texana* Krombein. Orig. desig.

**nocturna nocturna** Krombein. Md., La., Tex., Kans.

*Myrmosa* (*Myrmosina*) *nocturna nocturna* Krombein, 1940. Amer. Ent. Soc., Trans. 65: 454. ♂.

**nocturna rufigastra** Krombein. Tex., Calif.

*Myrmosa* (*Myrmosina*) *nocturna rufigastra* Krombein, 1940. Amer. Ent. Soc., Trans. 65: 455. ♂.

**texana** Krombein. Dak., Tex.

*Myrmosa* (*Myrmosina*) *texana* Krombein, 1940. Amer. Ent. Soc., Trans. 65: 453. ♂.

#### Genus LEIOMYRMOSA Wasbauer

*Leiomyrmosa* Wasbauer, 1974 (1973). Pan-Pacific Ent. 49: 325.

Type-species: *Leiomyrmosa spilota* Wasbauer. Orig. desig.

**spilota** Wasbauer. Calif. (Blythe in Riverside Co.).

*Leiomyrmosa spilota* Wasbauer, 1974 (1973). Pan-Pacific Ent. 49: 326, figs. 1, 2, 19, 23. ♀.

#### Genus MYRMOSULA Bradley

*Myrmosa* subg. *Myrmosula* Bradley, 1917. Amer. Ent. Soc., Trans. 43: 249.

Type-species: *Myrmosa parvula* Fox. Desig. by Bridwell, 1920.

Taxonomy: Mickel, 1940. Pan-Pacific Ent. 16: 133-134 (key to females). — Wasbauer, 1974 (1973). Pan-Pacific Ent. 49: 335-336 (key to females).

**boharti** Wasbauer. Calif. (Thousand Palms in Riverside Co.).

*Myrmosula boharti* Wasbauer, 1974 (1973). Pan-Pacific Ent. 49: 331, figs. 13, 14. ♀.

**exaggerata** (Krombein). Calif.

*Myrmosa* (*Myrmosula*) *exaggerata* Krombein, 1940. Amer. Ent. Soc., Trans. 65: 460. ♀.

Taxonomy: Mickel, 1940. Pan-Pacific Ent. 16: 133.

**nasuta** Wasbauer. Southern Calif. and Ariz. Ecology: Visits mat *Euphorbia* and has been collected in a kangaroo rat burrow.

*Myrmosula nasuta* Wasbauer, 1974 (1973). Pan-Pacific Ent. 49: 329, figs. 7, 8, 20. ♀.

**pacifica** (Mickel). Calif. (Antioch). Possibly a synonym of *exaggerata* Krom.

*Myrmosa* (*Myrmosula*) *pacifica* Mickel, 1940. Pan-Pacific Ent. 16: 134. ♀.

**parvula** (Fox). D. C. south to Ala., west to Mont. and Tex. Host: *Dialictus imitatus* (Sm.), *D. zephyrus* (Sm.); *Augochlorella striata* (Prov.)(?), *A. persimilis* (Vier.)(?).

*Myrmosa parvula* Fox, 1893. N. Y. Ent. Soc., Jour. 1: 53. ♂.

*Mutilla antisemitica* Dalla Torre, 1897. Cat. Hym., v. 8, p. 10. N. name for *Myrmosa parvula* Fox, not *Mutilla parvula* Fabricius.

*Brachycistis bimaculatus* Fox, 1899. Amer. Ent. Soc., Trans. 25: 285. ♀.

Taxonomy: Krombein, 1940. Amer. Ent. Soc., Trans. 65: 457-459, figs. 5, 10. ♂, ♀.

Biology: Michener and Wille, 1961. Univ. Kans. Sci. Bul. 42: 1130 (host record). — Ordway, 1964. Kans. Ent. Soc., Jour. 37: 149 (host records). — Batra, 1965. Kans. Ent. Soc., Jour. 38: 386-387 (behavior in host nest). — Brothers, 1972. Univ. Kans. Sci. Bul. 50: 23 (host record).

**peregrinatrix** (Krombein). Alta., Ariz., Tex.

*Myrmosa (Myrmosula) peregrinatrix* Krombein, 1946. Ent. Soc. Wash., Proc. 48: 247. ♀.

**rufiventris** Blake. Nev., Oreg.

*Myrmosa rufiventris* Blake, 1879. Amer. Ent. Soc., Trans. 7: 254. ♂.

*Mutilla erythrogastra* Dalla Torre, 1897. Cat. Hym., v. 8, p. 36. N. name for *Myrmosa rufiventris* Blake, not *Mutilla rufiventris* Klug nor *M. rufiventris* Smith.

Taxonomy: Krombein, 1940. Amer. Ent. Soc., Trans. 65: 459-460. ♂.

**rutilans** (Blake). Calif. Host: *Nomadopsis scutellaris* (Fwlr.)

*Mutilla rutilans* Blake, 1879. Amer. Ent. Soc., Trans. 7: 248. ♀.

Taxonomy: Krombein, 1940. Amer. Ent. Soc., Trans. 65: 461-462, fig. 12. ♀.

## Family SIEROLOMORPHIDAE

This is a primitive scolioid group whose closest relationship appears to be with the Tiphidae. The family is known from the single genus *Sierolomorpha* which has six New World species ranging from North America south to Panama, one possibly adventive species in Hawaii, and two Old World species from North China and Tadzhikistan.

There is no information on host relationships, but the lack of a tarsal pecten in *Sierolomorpha* females suggests that they are not fossorial in habit.

Revision: Evans, 1961. Breviora, No. 140, 12 pp., 6 figs.

Taxonomy: Melander and Brues, 1932. Mus. Compar. Zool. Bul. 73: 500. —Schuster, 1949.

Ent. Amer. (n. s.) 29: 124-125.

### Genus SIEROLOMORPHA Ashmead

*Sierolomorpha* Ashmead, 1903. Canad. Ent. 35: 42.

Type-species: *Sierola (?) ambigua* Ashmead. Orig. desig.

**apache** Evans. Ariz.

*Sierolomorpha apache* Evans, 1961. Breviora, No. 140, p. 5, fig. 6. ♂.

**bicolor** Evans. Ariz.

*Sierolomorpha bicolor* Evans, 1961. Breviora, No. 140, p. 4, fig. 5. ♀, ♂.

**brevicornis** Evans. S. C. (Greenville).

*Sierolomorpha brevicornis* Evans, 1961. Breviora, No. 140, p. 8, fig. 3. ♂.

**canadensis** (Provancher). Alta., Ont. and Mass. south to Ariz., Tex. and Fla.

*Photopsis canadensis* Provancher, 1888. Addit. Corr. Faune Ent. Canada Hym., p. 410. ♂.

Secondary homonym in *Mutilla*.

*Sierola? ambigua* Ashmead, 1893. U. S. Natl. Mus., Bul. 45: 56.

*Mutilla tertia* Dalla Torre, 1897. Cat. Hym., v. 8, p. 91. N. name.

**nigrescens** Evans. Yukon, Alta. and Sask. south to Calif., Ariz. and Colo.

*Sierolomorpha nigrescens* Evans, 1961. Breviora, No. 140, p. 9, fig. 1. ♂, ♀.

**similis** Evans. Conn. south to Ga., W. Va., Kans.

*Sierolomorpha similis* Evans, 1961. Breviora, No. 140, p. 6, fig. 4. ♂, ♀.

## Family MUTILLIDAE

Females are entirely wingless and have a greatly modified thorax. Males are normally fully winged, but are brachypterous or apterous in a few species. Some females are called cowkillers or mulekillers because of their size and painful sting, or velvet ants because of the appearance of the dense pile covering the body.

Hosts are known for very few of the North American species. The stages of host attacked are limited to diapausing larvae or pupae. Most recorded North American hosts are wasps or bees which nest in the soil, in borings in wood or which build mud or resin cells or paper nests. However, there is one authenticated record of coleopterous pupae as a host. Extralimital genera have been recorded as parasitizing Lepidoptera, Coleoptera and Diptera, as well as aculeate Hymenoptera.

Brothers' important contribution on phylogeny of the Mutillidae was received too late to adopt



his classification but it will be used in the next edition. He places the Myrmosinae here rather than in the Tiphidae. He raises the exotic Bradynobaeninae to family rank and transfers to it as subfamilies the Typhoctinae and Chyphotinae (here considered a tribe of Apterogyninae). He assigns the other North American genera as follows: Sphaerophthalminae, Pseudomethocina, *Myrmilloides*, *Pseudomethoca*; Sphaerophthalminae, Sphaerophthalmina, *Acanthophotopsis*, *Acrophotopsis*, *Dasymutilla*, *Dilophotopsis*, *Lomachaeta*, *Morsyma*, *Odontophotopsis*, *Photomorphus*, *Protophotopsis*, *Smicromutilla*, *Sphaerophthalma*; Mutillinae, Mutillini, *Smicromyrmina*, *Timulla*; and Mutillinae, Ephutini, *Ephuta*.

Taxonomy: Blake, 1886. Amer. Ent. Soc., Trans. 13: 179-286, 21 figs. (N. A. spp.). — Ashmead, 1899. N. Y. Ent. Soc., Jour. 7: 52-60 (gen. of world). — Fox, 1899. Amer. Ent. Soc., Trans. 25: 219-292 (N. A. spp.). — Andre, 1903. In Wytsman, Gen. Ins., fasc. 11, pp. 1-77, 3 pls. (gen. of world). — Melander, 1903. Amer. Ent. Soc., Trans. 29: 291-330, pl. 4 (taxonomic notes and some revised keys). — Bradley, 1916. Amer. Ent. Soc., Trans. 42: 309-336 (spp. of east. U. S.). — Schuster, 1946. Ent. Soc. Amer., Ann. 39: 700-703 (subfam. of New World). — Schuster, 1949. Ent. Amer. (n. s.) 29: 61-64 (key to Neotrop. subfam.). — Mickel, 1970. Minn. Univ., Agr. Expt. Sta., Tech. Bul. 271: 1-77 (annotated bibliography of world literature). — Brothers, 1975. Kans. Univ. Sci. Bul. 50: 483-648, 101 figs., 7 tabs. (phylogeny).

Morphology: Reid, 1941. Roy. Ent. Soc. London, Trans. 91: 375-387, figs. 1-10, 15-20 (female, male thorax). — Hinton, Gibbs and Silberglied, 1969. Jour. Ins. Physiol. 15: 549-552, 10 figs. (stridulatory file). — Sheldon, 1970. Ent. News 81: 57-61 (male adaptations for female carriage). — Debolt, 1973. Ent. Soc. Amer., Ann. 66: 100-108, 15 figs. (felt line and felt line organ).

#### SUBFAMILY APTEROGYNINAE

The North American species are all nocturnal.

#### TRIBE CHYPHOTINI

#### Genus CHYPHOTES Blake

Revision: Buzicky, 1941. Ent. Amer. (n. s.) 21: 201-243. — Mickel, 1967. Amer. Ent. Soc., Trans. 93: 125-234, 40 figs., 26 maps.

#### Genus CHYPHOTES Subgenus CHYPHOTES Blake

*Chyphotus* Blake, 1886. Amer. Ent. Soc., Trans. 13: 276.

Type-species: *Chyphotus elevatus* Blake. Orig. desig.

*Blaketa* Pate, 1948. Ent. News 59: 41. N. name for *Chyphotus* Blake, not *Cyphotus* Burmeister 1835.

*aenigmus* Mickel. N. Mex. to Calif.; Mexico (Sonora).

*Chyphotus (Chyphotus) aenigmus* Mickel, 1967. Amer. Ent. Soc., Trans. 93: 147, fig. 2, map 5. ♂.

*atriceps* Mickel. Wash., Idaho, Oreg., Calif., Nev., Utah, Ariz., N. Mex., west. Tex.; Mexico (Sonora, Chihuahua).

*Chyphotus (Chyphotus) atriceps* Mickel, 1967. Amer. Ent. Soc., Trans. 93: 134, fig. 1, map 1. ♂.

*auripilus* Buzicky. Calif., Ariz.

*Chyphotus auripilus* Buzicky, 1941. Ent. Amer. (n. s.) 21: 232. ♀.

Taxonomy: Mickel, 1967. Amer. Ent. Soc., Trans. 93: 174.

*belfragei* (Blake). Wyo., Nebr., Colo., Utah, Ariz., N. Mex.; Mexico (Baja California, Chihuahua to Nuevo Leon, south to Jalisco and Puebla).

*Agama Belfragei* Blake, 1871. Amer. Ent. Soc., Trans. 3: 263. ♂.

*Sphaerophthalma(!) frugata* Cameron, 1896. Biol. Cent.-Amer., Hym. 2: 394. ♂.

Taxonomy: Mickel, 1967. Amer. Ent. Soc., Trans. 93: 151, fig. 12, map 7. ♂, ♀.

Morphology: Reid, 1941. Roy. Ent. Soc. London, Trans. 91: 386-387, figs. 19-20 (male thorax).

**bicolor** Schuster. Calif. (San Diego).

*Chyphotes bicolor* Schuster, 1945. Pan-Pacific Ent. 21: 89. ♀.

**calexicensis** Bradley. Ariz., Calif.; Mexico (Baja California, Sonora).

*Chyphotes calexicensis* Bradley, 1917. Amer. Ent. Soc., Trans. 43: 284. ♂.

Taxonomy: Mickel, 1967. Amer. Ent. Soc., Trans. 93: 144, fig. 7, map 4.

**californicus** Baker. Ariz., Nev., Calif.

*Chyphotes californicus* Baker, 1905. Invertebrata Pacifica 1: 117. ♂.

Taxonomy: Mickel, 1967. Amer. Ent. Soc., Trans. 93: 171, fig. 23, map 14.

**capitatus** Mickel. Ariz.

*Chyphotes (Chyphotes) capitatus* Mickel, 1967. Amer. Ent. Soc., Trans. 93: 166, fig. 19, map 11. ♂.

**cooki** Mickel. Calif.

*Chyphotes (Chyphotes) cooki* Mickel, 1967. Amer. Ent. Soc., Trans. 93: 159, fig. 17, map 9. ♂.

**dubius** Mickel. Calif., Ariz.; Mexico (Chihuahua).

*Chyphotes (Chyphotes) dubius* Mickel, 1967. Amer. Ent. Soc., Trans. 93: 175. ♀.

**elevatus** Blake. N. Mex., Ariz.; Mexico (Sonora).

*Chyphotes elevatus* Blake, 1886. Amer. Ent. Soc., Trans. 13: 276. ♀.

Taxonomy: Mickel, 1967. Amer. Ent. Soc., Trans. 93: 155, fig. 11, map 8. ♂, ♀.

**incredulus** Mickel. Southwest Tex., south. N. Mex.; Mexico (Chihuahua, Nuevo Leon, Durango).

*Chyphotes (Chyphotes) incredulus* Mickel, 1967. Amer. Ent. Soc., Trans. 93: 149, fig. 15, map 6. ♂.

**knulli** Mickel. Tex. (Davis Mts.).

*Chyphotes (Chyphotes) knulli* Mickel, 1967. Amer. Ent. Soc., Trans. 93: 181. ♀.

**mandibularis** Mickel. Calif.

*Chyphotes (Chyphotes) mandibularis* Mickel, 1967. Amer. Ent. Soc., Trans. 93: 139, fig. 3, map 2. ♂, ♀.

**melaniceps** (Blake). Utah, Nev., Ariz., Calif.; Mexico (Baja California).

*Photopsis melaniceps* Blake, 1886. Amer. Ent. Soc., Trans. 13: 264. ♂.

*Chyphotes piceiceps* Baker, 1905. Invertebrata Pacifica 1: 116. ♂.

Taxonomy: Mickel, 1967. Amer. Ent. Soc., Trans. 93: 141, fig. 6, map 3.

**mexicanus** Mickel. West. Tex., Ariz.; Mexico (Chihuahua, Sinaloa, Nayarit).

*Chyphotes (Chyphotes) mexicanus* Mickel, 1967. Amer. Ent. Soc., Trans. 93: 168, fig. 20, map 12. ♂.

**minusculus** Mickel. Ariz., Nev., Calif.; Mexico (Baja California).

*Chyphotes (Chyphotes) minusculus* Mickel, 1967. Amer. Ent. Soc., Trans. 93: 163, fig. 18, map 10. ♂.

**peninsularis** Fox. Calif.; Mexico (Baja California).

*Chyphotes peninsularis* Fox, 1899. Amer. Ent. Soc., Trans. 25: 277. ♂.

*Chyphotes jugatus* Buzicky, 1941. Ent. Amer. (n. s.) 21: 222. ♂.

*Chyphotes pilosus* Buzicky, 1941. Ent. Amer. (n. s.) 21: 233. ♀.

Taxonomy: Mickel, 1967. Amer. Ent. Soc., Trans. 93: 170, figs. 4, 21, map 13.

**petiolatus** Fox. Tex., Ariz., Nev., Calif.

*Chyphotes petiolatus* Fox, 1899. Amer. Ent. Soc., Trans. 25: 277. ♀.

Taxonomy: Mickel, 1967. Amer. Ent. Soc., Trans. 93: 174.

**pimus** Mickel. Ariz. (Pima Co.).

*Chyphotes (Chyphotes) pimus* Mickel, 1967. Amer. Ent. Soc., Trans. 93: 181, fig. 5. ♀.

**rugosus** Mickel. Calif.

*Chyphotes (Chyphotes) rugosus* Mickel, 1967. Amer. Ent. Soc., Trans. 93: 177. ♀.

**rugulosus** Mickel. Ariz. (Pima Co.).

*Chyphotes (Chyphotes) rugulosus* Mickel, 1967. Amer. Ent. Soc., Trans. 93: 173. ♀.

**testaceipes** Fox. Ariz.*Chyphotes testaceipes* Fox, 1899. Amer. Ent. Soc., Trans. 25: 277. ♀.

Taxonomy: Mickel, 1967. Amer. Ent. Soc., Trans. 93: 173.

Morphology: Reid, 1941. Roy. Ent. Soc. London, Trans. 91: 386-387, figs. 17-18 (thorax).

**wasbaueri** Mickel. Calif. (San Bernardino Co.).*Chyphotes (Chyphotes) wasbaueri* Mickel, 1967. Amer. Ent. Soc., Trans. 93: 180. ♀.**Genus CHYPHOTES Subgenus PITANTA** Pate*Pitanta* Pate, 1947. Notulae Nat. 192: 1.Type-species: *Pitanta mojave* Pate. Orig. design.

## SPECIES GROUP SIMILIS

**similis** Baker. Calif.; Mexico (Baja California).*Chyphotes similis* Baker, 1905. Invertebrata Pacifica 1: 117. ♂.

Taxonomy: Mickel, 1967. Amer. Ent. Soc., Trans. 93: 188, fig. 8, map 15.

## SPECIES GROUP NUBECULUS

**fergusoni** Mickel. Oreg., Idaho, Utah, Nev., Calif.*Chyphotes (Pitanta) fergusoni* Mickel, 1967. Amer. Ent. Soc., Trans. 93: 193, fig. 24, map 17. ♂.**nubeculus** (Cresson). Mont., Wyo., Nebr., Kans., Colo., Tex., N. Mex., Ariz.; Mexico (Sonora).*Mutilla nubecula* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 440. ♂.

Taxonomy: Mickel, 1967. Amer. Ent. Soc., Trans. 93: 191, fig. 22, map 16.

## SPECIES GROUP HEATHII

**bruscus** Buzicky. Ariz., Calif.*Chyphotes bruscus* Buzicky, 1941. Ent. Amer. (n. s.) 21: 214. ♂.

Taxonomy: Mickel, 1967. Amer. Ent. Soc., Trans. 93: 195, fig. 26, map 19.

**heathii** Melander. Calif. (Pacific Grove).*Chyphotes Heathii* Melander, 1903. Amer. Ent. Soc., Trans. 29: 326. ♂.

Taxonomy: Mickel, 1967. Amer. Ent. Soc., Trans. 93: 194, fig. 25, map 18.

## SPECIES GROUP PALLIDUS

**buzickyi** Mickel. Calif.; Mexico (Baja California).*Chyphotes (Pitanta) buzickyi* Mickel, 1967. Amer. Ent. Soc., Trans. 93: 200, fig. 14. ♂, ♀.**marginalis** Mickel. Calif. (Imperial Co.).*Chyphotes (Pitanta) marginalis* Mickel, 1967. Amer. Ent. Soc., Trans. 93: 196, fig. 27. ♂.**minimus** Mickel. Ariz.; Mexico (Sonora).*Chyphotes minimus* Mickel, 1963. Pan-Pacific Ent. 39: 186. ♂.**mojave** (Pate). Calif.*Pitanta mojave* Pate, 1947. Notulae Nat. 192: 3. ♂.

Taxonomy: Mickel, 1967. Amer. Ent. Soc., Trans. 93: 202, fig. 29. ♂, ♀.

**nitidus** Mickel. Calif. (Winterhaven, Glamis).*Chyphotes nitidus* Mickel, 1963. Pan-Pacific Ent. 39: 188. ♀.

Taxonomy: Mickel, 1974. Ent. Soc. Amer., Ann. 67: 461, fig. 1. ♂.

**pallidus** Buzicky. Ariz., Calif.*Chyphotes pallidus* Buzicky, 1941. Ent. Amer. (n. s.) 21: 226. ♂.

Taxonomy: Mickel, 1967. Amer. Ent. Soc., Trans. 93: 198, fig. 28, map 20.

## SPECIES GROUP ALBIPES

**albipes** (Cresson). Alta., B. C., Idaho, Wash., Oreg., Calif., Nev., Utah, Ariz.*Agama albipes* Cresson, 1874. Amer. Ent. Soc., Trans. 5: 99. ♂.*Chyphotes nevadensis* Baker, 1905. Invertebrata Pacifica 1: 118. ♂.

Taxonomy: Buzicky, 1941. Ent. Amer. (n. s.) 21: 215-217. ♀. — Mickel, 1967. Amer. Ent. Soc., Trans. 93: 206, fig. 34, map 21.

**mickeli inyoensis** Mickel. Calif. (Inyo Co.).

*Chyphotes (Pitanta) mickeli inyoensis* Mickel, 1967. Amer. Ent. Soc., Trans. 93: 213, fig. 33. ♂.

**mickeli mickeli** Buzicky. N. Mex., Ariz., Calif.; Mexico (Baja California).

*Chyphotes mickeli mickeli* Buzicky, 1941. Ent. Amer. (n. s.) 21: 217. ♂.

Taxonomy: Mickel, 1967. Amer. Ent. Soc., Trans. 93: 209, fig. 32, map 22. ♂, ♀.

**mickeli polingi** Buzicky. Tex., N. Mex.

*Chyphotes mickeli polingi* Buzicky, 1941. Ent. Amer. (n. s.) 21: 219. ♂.

Taxonomy: Mickel, 1967. Amer. Ent. Soc., Trans. 93: 214.

#### SPECIES GROUP STRAMINEUS

**stramineus** Mickel. Ariz., Nev., Calif.; Mexico (Baja California).

*Chyphotes (Pitanta) stramineus* Mickel, 1967. Amer. Ent. Soc., Trans. 93: 215, fig. 30, map 23. ♂.

#### SPECIES GROUP MELLIPES

**epedaphus** Buzicky. Ariz., Calif.

*Chyphotes epedaphus* Buzicky, 1941. Ent. Amer. (n. s.) 21: 231. ♀.

Taxonomy: Mickel, 1967. Amer. Ent. Soc., Trans. 93: 232.

**evansi** Mickel. N. Mex.

*Chyphotes (Pitanta) evansi* Mickel, 1967. Amer. Ent. Soc., Trans. 93: 231. ♀.

**gracilis** Mickel. Tex.; Mexico (Nuevo Leon).

*Chyphotes (Pitanta) gracilis* Mickel, 1967. Amer. Ent. Soc., Trans. 93: 225, fig. 37, map 26. ♂.

**mellipes** (Blake). Wash., Oreg., Idaho, Calif., Nev., Utah, Colo., west. Kans., Tex., N. Mex., Ariz.; Mexico (Chihuahua, Durango, Zacatecas, San Luis Potosi, Jalisco).

*Agama attenuata* Blake, 1872. Amer. Ent. Soc., Trans. 4: 76. ♂.

*Photopsis mellipes* Blake, 1886. Amer. Ent. Soc., Trans. 13: 262. ♂.

*Photopsis picus* Cockerell, 1895. Amer. Ent. Soc., Trans. 22: 289. ♂.

*Mutilla picas* (!) Dalla Torre, 1897. Cat. Hym., v. 8, p. 73.

*Mutilla tenula* Dalla Torre, 1897. Cat. Hym., v. 8, p. 91. N. name for *Agama attenuata* Blake, not *Mutilla attenuata* Spinola.

*Chyphotes punctatus* Fox, 1899. Amer. Ent. Soc., Trans. 25: 276. ♀.

*Chyphotes striatus* Buzicky, 1941. Ent. Amer. (n. s.) 21: 228. ♀.

*Chyphotes segregatus* Buzicky, 1941. Ent. Amer. (n. s.) 21: 229. ♀.

Taxonomy: Mickel, 1967. Amer. Ent. Soc., Trans. 93: 216, fig. 31, map 24.

**pixus** Buzicky. Ariz. (Gila Bend).

*Chyphotes pixus* Buzicky, 1941. Ent. Amer. (n. s.) 21: 227. ♀.

**sonorus** Mickel. Ariz.; Mexico (Sonora).

*Chyphotes (Pitanta) sonorus* Mickel, 1967. Amer. Ent. Soc., Trans. 93: 223, fig. 35, map 25. ♂.

**subulatus** Buzicky. Ariz.

*Chyphotes subulatus* Buzicky, 1941. Ent. Amer. (n. s.) 21: 224. ♂.

Taxonomy: Mickel, 1967. Amer. Ent. Soc., Trans. 93: 226, fig. 39.

#### SUBFAMILY TYPHOCTINAE

Revision: Krombein and Schuster, 1957. Ent. Soc. Wash., Proc. 59: 209-232, 2 pls.

All known species are diurnal insects.

#### Genus TYPHOCTES Ashmead

*Typhoctes* Ashmead, 1899. N. Y. Ent. Soc., Jour. 7: 53.

Type-species: *Mutilla peculiaris* Cresson. Orig. desig.

*Anommotilla* Mickel, 1936. Ent. Soc. Amer., Ann. 29: 295.

Type-species: *Anommotilla difficilis* Mickel. Orig. desig.

Taxonomy: Brothers, 1970. Kans. Ent. Soc., Jour. 43: 305 (generic redescription, female).

Morphology: Reid, 1941. Roy. Ent. Soc. London, Trans. 91: 385-386, figs. 15-16 (female thorax).

**peculiaris mirabilis** (Cockerell). Kans., Colo., Tex., N. Mex., Ariz.; Mexico (Chihuahua).

*Chyphotes mirabilis* Cockerell, 1896. Canad. Ent. 28: 285. ♀.

**peculiaris peculiaris** (Cresson). Wash., Idaho, Utah, Ariz., Calif.

*Mutilla peculiaris* Cresson, 1875. Amer. Ent. Soc., Trans. 5: 119. ♀.

*Anommotilla difficilis* Mickel, 1936. Ent. Soc. Amer., Ann. 29: 295. ♂.

Morphology: Hermann, 1975. Ent. Soc. Amer., Ann. 68: 882-884, 5 figs. (sting).

**striolatus** Krombein and Schuster. Ariz. to western Tex.

*Typhoctes striolatus* Krombein and Schuster, 1957. Ent. Soc. Wash., Proc. 59: 223, fig. 2. ♀, ♂.

**williamsi** Krombein and Schuster. Southern Calif.

*Typhoctes williamsi* Krombein and Schuster, 1957. Ent. Soc. Wash., Proc. 59: 220, figs. 1, 4. ♂, ♀.

## SUBFAMILY MUTILLINAE

### TRIBE MUTILLINI

Blake (1886. Amer. Ent. Soc., Trans. 13) described three species of *Mutilla*, mislabeled as coming from Florida, from the Harris collection. Fox, 1898 (Ent. News 9: 14) stated that *M. ajax* was a synonym of the African *Psammotherma flabellata* (F.), *M. floridana* a synonym of the European *Dasylabris maura* (L.), and *M. trisignata* a synonym of the European *D. arenaria* (F.).

## Genus TIMULLA Ashmead

### Genus TIMULLA Subgenus TIMULLA Ashmead

*Timulla* Ashmead, 1899. N. Y. Ent. Soc., Jour. 7: 55.

Type-species: *Mutilla dubitata* Smith. Orig. desig.

Revision: Mickel, 1937. Ent. Amer. (n. s.) 17: 1-119 (N. Amer. spp.).

Only the typical subgenus occurs in the New World. Most species are diurnal, but a few species with enlarged ocelli, such as *ocellaria* Mick., are crepuscular or nocturnal.

**barbata** (Fox). Mo., La.

*Mutilla barbata* Fox, 1899. Amer. Ent. Soc., Trans. 25: 272. ♂.

**barbigera barbigera** (Bradley). Va. south to Fla., west to S. Dak. and Tex. in U. and L. Austr. Zones.

*Mutilla (Timulla) barbigera* Bradley, 1916. Amer. Ent. Soc., Trans. 42: 206. ♂.

**barbigera rohweri** Mickel. Kans., Okla. in U. Sonor. Zone.

*Timulla (Timulla) barbigera rohweri* Mickel, 1937. Ent. Amer. (n. s.) 17: 58. ♂.

**compressicornis** Mickel. N. C. to Tex. in L. Austr. Zone.

*Timulla (Timulla) compressicornis* Mickel, 1937. Ent. Amer. (n. s.) 17: 59. ♂.

**contigua** Mickel. Tex. (Brownsville).

*Timulla (Timulla) contigua* Mickel, 1937. Ent. Amer. (n. s.) 17: 107. ♀.

**dubitata dubitata** (Smith). N. Y. south to Fla., west to Okla. and Tex. in L. Austr. Zone.

*Mutilla dubitata* Smith, 1855. Cat. Hym. Brit. Mus., v. 3, p. 60. ♀.

*Mutilla dubiatta* (!) Blake, 1886. Amer. Ent. Soc., Trans. 13: 201. ♀.

Biology: Sheldon, 1970. Ent. News 81: 59-60 (mating behavior).

**dubitata fugitiva** Mickel. N. J. south to Ga., west to Nebr. and Tex. in U. Austr. Zone.

*Timulla (Timulla) dubitata fugitiva* Mickel, 1937. Ent. Amer. (n. s.) 17: 39. ♂.

**dubitatiformis** Mickel. Mass. south to Fla., west to Mont. and Tex.

*Timulla (Timulla) dubitatiformis* Mickel, 1937. Ent. Amer. (n. s.) 17: 102. ♀.

**euphrosyne** Mickel. Fla., Tex.

*Timulla (Timulla) euphrosyne* Mickel, 1937. Ent. Amer. (n. s.) 17: 64. ♀.

**euterpe** (Blake). N. C., Fla., La., Tex.

*Mutilla Euterpe* Blake, 1879. Amer. Ent. Soc., Trans. 7: 249. ♀.

**ferrugata** (Fabricius). N. J. south to Fla., west to Okla. and Tex. in U. and L. Austr. Zones.

Host: *Eumenes fraternus* Say.

*Mutilla ferrugata* Fabricius, 1805. Systema Piezatorum, p. 438. ♀.

*Mutilla rufa* Lepeletier, 1845. Hist. Nat. Ins. Hym., v. 3, p. 631. ♂.

*Mutilla Promethea* Blake, 1871. Amer. Ent. Soc., Trans. 3: 229. ♂.

Biology: Fattig, 1943. Emory Univ. Mus. Bul. 1: 3 (host).

**floridensis** (Blake). S. C. to Tex. in L. Austr. Zone.

*Mutilla floridensis* Blake, 1879. Amer. Ent. Soc., Trans. 7: 249. ♂.

**grotei** (Blake). Colo., Utah, Tex., N. Mex., Ariz.; Mexico (Jalisco, Guanajuato).

*Mutilla Grotei* Blake, 1871. Amer. Ent. Soc., Trans. 3: 228. ♂.

*Mutilla fulviventris* Gerstaecker, 1874. Arch. Naturgesch. 40: 323. ♂.

Taxonomy: Mickel, 1937. Ent. Amer. (n. s.) 17: 78.

**hollensis hollensis** (Melander). Mass., N. Y., Md.

*Mutilla Sayi* var. *hollensis* Melander, 1903. Amer. Ent. Soc., Trans. 29: 324. ♂.

**hollensis melanderi** Mickel. N. J., Pa., Md., Va.

*Timulla (Timulla) hollensis melanderi* Mickel, 1937. Ent. Amer. (n. s.) 17: 101. ♂.

**huntleyensis** Mickel. Mont. (Huntley).

*Timulla (Timulla) huntleyensis* Mickel, 1937. Ent. Amer. (n. s.) 17: 82. ♂.

**kansana** Mickel. Kans.

*Timulla (Timulla) kansana* Mickel, 1937. Ent. Amer. (n. s.) 17: 94. ♂.

**leona** (Blake). Wis. south to Fla., west to Nebr. and Tex. in U. and L. Austr. Zones. Host:

*Bembix troglodytes* Handl.?

*Mutilla Leona* Blake, 1871. Amer. Ent. Soc., Trans. 3: 230. ♀.

Biology: Evans, 1957. Studies in Compar. Ethology *Bembix*, p. 134, fig. 36 (entering burrows of *B. troglodytes*).

**navasota coahuila** Krombein. Tex. west of 100th Meridian, N. Mex., Ariz.

*Timulla (Timulla) navasota nebulosa* Mickel, 1937. Ent. Amer. (n. s.) 17: 29. ♂. Preocc. by Mickel, 1935.

*Timulla (Timulla) navasota coahuila* Krombein, 1951. U. S. Dept. Agr., Monog. 2: 771. N. name.

**navasota navasota** (Bradley). Tex. east of 100th Meridian.

*Mutilla (Timulla) navasota* Bradley, 1916. Amer. Ent. Soc., Trans. 42: 213. ♂.

**neobule** Mickel. Ariz.

*Timulla (Timulla) neobule* Mickel, 1937. Ent. Amer. (n. s.) 17: 44. ♂.

**nicholi** Mickel. Ariz.

*Timulla (Timulla) nicholi* Mickel, 1937. Ent. Amer. (n. s.) 17: 47. ♀.

**nitela** Mickel. Ariz. (Douglas).

*Timulla (Timulla) nitela* Mickel, 1937. Ent. Amer. (n. s.) 17: 43. ♂.

**oajaca** (Blake). Tex., N. Mex., Ariz.; Mexico (Morelos, Jalisco, Colima).

*Mutilla oajaca* Blake, 1871. Amer. Ent. Soc., Trans. 3: 228. ♂ (♀ misdet.).

*Mutilla ardens* Gerstaecker, 1874. Arch. Naturgesch. 40: 323. ♂.

*Mutilla mazatlanae* Cameron, 1894. Biol. Cent.-Amer., Hym., v. 2, p. 294. ♂.

*Mutilla nestor* Fox, 1899. Amer. Ent. Soc., Trans. 25: 271. ♂.

*Mutilla ornata* Howard, 1901. Insect Book, pl. 8, fig. 21. ♀.

Taxonomy: Mickel, 1938. Roy. Ent. Soc. London, Trans. 87: 641.

Biology: Linsley, 1960. Pan-Pacific Ent. 36: 36 (mating behavior).

**ocellaria ocellaria** Mickel. Ohio, Ind., Ky., Tenn., Ga. Host: *Ligyrrus gibbosus* (Deg.), pupae.

*Timulla (Timulla) ocellaria ocellaria* Mickel, 1937. Ent. Amer. (n. s.) 17: 91. ♂.

Biology: Fattig, 1943. Emory Univ. Mus. Bul. 1: 5 (host record).

**ocellaria rufidorsa** Mickel. Miss., Ark., Mo., Kans., Okla., Tex.

*Timulla (Timulla) ocellaria rufidorsa* Mickel, 1937. Ent. Amer. (n. s.) 17: 93. ♂.

**ornatipennis** (Bradley). N. J. south to Fla. west to Tenn. and Miss.

*Mutilla (Timulla) ornatipennis* Bradley, 1916. Amer. Ent. Soc., Trans. 42: 205. ♀, ♂.

**rufosignata** (Bradley). N. C., Ga., Fla. Host: Ground-nesting eumenid wasp.

*Mutilla (Timulla) rufosignata* Bradley, 1916. Amer. Ent. Soc., Trans. 42: 212. ♂.

Taxonomy: Krombein, 1953. Ent. Soc. Wash., Proc. 55: 128. ♀.

Biology: Fattig, 1943. Emory Univ. Mus. Bul. 1: 6 (ground-nesting host misdet. as *Odynerus erinnys* (!) Lep.).

**sayi** (Blake). Tex. (Plano).

*Mutilla Sayi* Blake, 1871. Amer. Ent. Soc., Trans. 3: 229. ♂.

**subhyalina** Mickel. Ill., Iowa, Minn., N. Dak., S. Dak., Nebr., Kans., Mont., Oreg., B. C.

*Timulla (Timulla) subhyalina* Mickel, 1937. Ent. Amer. (n. s.) 17: 97. ♂.

**suspensa jonesi** Mickel. Tex., Ariz.

*Timulla (Timulla) suspensa jonesi* Mickel, 1937. Ent. Amer. (n. s.) 17: 90. ♂.

**suspensa sonora** Mickel. Kans. and Colo. south to Tex. and Ariz.

*Timulla (Timulla) suspensa sonora* Mickel, 1937. Ent. Amer. (n. s.) 17: 84. ♀, ♂.

**suspensa suspensa** (Gerstaecker). Ariz.

*Mutilla suspensa* Gerstaecker, 1874. Arch. f. Naturgesch. 40: 299. ♀.

**tolerata** Mickel. Mo., Ga.

*Timulla (Timulla) tolerata* Mickel, 1937. Ent. Amer. (n. s.) 17: 109. ♂.

**tyro** Mickel. Ariz., Calif.

*Timulla (Timulla) tyro* Mickel, 1937. Ent. Amer. (n. s.) 17: 25. ♀, ♂.

**vagans rufinota** Mickel. D. C., S. C., Ga., Fla.

*Timulla (Timulla) vagans rufinota* Mickel, 1937. Ent. Amer. (n. s.) 17: 78. ♀, ♂.

**vagans vagans** (Fabricius). Vt. and Ont. south to Ala., west to B. C. and N. Mex.

*Mutilla vagans* Fabricius, 1798. Sup. Ent. System., p. 282. ♀.

*Mutilla (Mutilla) hexagona* Say, 1836. Boston Jour. Nat. Hist. 1: 295. ♂.

*Mutilla ornativentris* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 438. ♀.

*Mutilla Briarus* Blake, 1871. Amer. Ent. Soc., Trans. 3: 227. ♂.

*Mutilla Canadensis* Provancher, 1887. Addit. Corr. Faune Ent. Canada Hym., p. 250. ♂.

Preoce.

*Mutilla secunda* Dalla Torre, 1897. Cat. Hym., v. 8, p. 84. N. name for *Mutilla Canadensis* Provancher, not *Mutilla canadensis* Blake.

Biology: Fattig, 1936. Ent. News 47: 51-52 (mating behavior). —Shappirio, 1948. Brooklyn Ent. Soc., Bul. 42: 163 (mating behavior).

**wileyae** Mickel. Ark., La., Okla., Tex.

*Timulla (Timulla) wileyae* Mickel, 1937. Ent. Amer. (n. s.) 17: 41. ♀.

#### TRIBE EPHUTINI

#### Genus EPHUTA Say

Revision: Bradley, 1916. Amer. Ent. Soc., Trans. 42: 187-198. —Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 1-43, 5 pls. (Part I containing only gen. diag. and key to spp.). —Schuster, 1957. N. Y. Ent. Soc., Jour. 64: 7-84 (Part II of revis. treating Species Group Grisea).

All of the species are diurnal.

#### Genus EPHUTA Subgenus EPHUTA Say

*Ephuta* Say, 1836. Boston Jour. Nat. Hist. 1: 297.

Type-species: *Mutilla (Ephuta) scruposa* Say. Desig. by Ashmead, 1899.

*Rhoptronutilla* Andre, 1903. In Wytsman, Gen. Ins., fasc. 11, p. 43.

Type-species: *Mutilla chrysodora* Perty. Orig. desig.

*Ephutopsis* Ashmead, 1904. Canad. Ent. 36: 6.

Type-species: *Mutilla odontophora* Cameron. Desig. by Mickel, 1928.

The few authenticated host records indicate that species of this subgenus have various species of Pompilidae as hosts. The spider wasp hosts have diverse nesting habits. Some nest in borings in wood (*Dipogon*), some construct mud cells beneath stones (*Phanagenia*), and some nest in the ground (? *Anoplius fraternus* (Bks.)).

**albiceps** Schuster. Tex. (Tyler).

*Ephuta albiceps* Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 31 (in key). ♀.

Taxonomy: Schuster, 1957. N. Y. Ent. Soc., Jour. 64: 75 (female description).

**argenteiceps** Schuster. Calif.

*Ephuta californica* Schuster, 1951. N. Y. Ent. Soc., Jour. 59: footnote on p. 25. ♂ (On p. 15 Schuster states that there is only one sp. in Calif., and in key to females, *argenteiceps* is the only sp. stated to be from Calif.).

*Ephuta argenteiceps* Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 26, 32 (in key). ♂, ♀.

Taxonomy: Schuster, 1957. N. Y. Ent. Soc., Jour. 64: 16 (male, female description).

**auricapitis** Schuster. Tex. (Edinburgh). Possibly the opposite sex of *ecarinata ecarinata* Schuster.

*Ephuta auricapitis* Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 31 (in key). ♀.

Taxonomy: Schuster, 1957. N. Y. Ent. Soc., Jour. 64: 76 (female description).

**baboquivari** Schuster. Ariz. (Baboquivari Mts.)

*Ephuta baboquivari* Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 31 (in key), figs. 39, 41. ♀.

Taxonomy: Schuster, 1957. N. Y. Ent. Soc., Jour. 64: 79 (female description).

**battlei battlei** Bradley. Coastal N. C., Ga., Fla.

*Ephuta battlei* Bradley, 1916. Amer. Ent. Soc., Trans. 42: 195. ♂.

Taxonomy: Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 29, figs. 5, 44 (in key; reduced to subsp. rank).

**battlei confusa** Schuster. Piedmont and west. coastal plain, N. C., Ga., Ala.

*Ephuta battlei confusa* Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 29 (in key), fig. 44. ♂.

**battlei microcellaria** Schuster. N. J. (Cape May).

*Ephuta battlei microcellaria* Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 29 (in key), fig. 44. ♂.

**battlei transitionalis** Schuster. Transit. and U. Austr. Zones, Mass. to Va., Ohio.

*Ephuta battlei transitionalis* Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 28 (in key), fig. 44. ♂.

**cephalotes** Schuster. N. Dak., S. Dak., Wyo., Ariz., west. Tex. The opposite sex is possibly *minuta* Schuster.

*Ephuta cephalotes* Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 24 (in key), figs. 10, 20, 46. ♂.

Taxonomy: Schuster, 1957. N. Y. Ent. Soc., Jour. 64: 68 (male description).

**coloradella** Schuster. Colo. Possibly the opposite sex of *grisea* Bradley.

*Ephuta coloradella* Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 32 (in key). ♀.

Taxonomy: Schuster, 1957. N. Y. Ent. Soc., Jour. 64: 73 (female description).

**conchate** Mickel. N. Y., Mich., Ill., Iowa, Minn., S. Dak., Nebr., Kans.

*Ephuta conchate* Mickel, 1928. Minn. State Ent., Rpt. 19: 111. ♂.

Taxonomy: Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 32 (in key).

**copano** (Blake). Tex.; Mexico.

*Mutilla Copano* Blake, 1871. Amer. Ent. Soc., Trans. 3: 232. ♂.

*Mutilla susura* Melander, 1903. Amer. Ent. Soc., Trans. 29: 324. ♂.

Taxonomy: Schuster, 1958. In Krombein, U. S. Dept. Agr., Monog. 2, Sup. 1: 105 (synonymy).

**ecarinata ecarinata** Schuster. Tex.; Mexico. The opposite sex is possibly *sudatrix* (Melander) or *auricapitis* Schuster.

*Ephuta ecarinata ecarinata* Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 26 (in key). ♂.

Taxonomy: Schuster, 1957. N. Y. Ent. Soc., Jour. 64: 49 (male description).



**ecarinata neomexicana** Schuster. N. Mex.

*Ephuta ecarinata neomexicana* Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 26 (in key). ♂.

Taxonomy: Schuster, 1957. N. Y. Ent. Soc., Jour. 64: 52 (male description).

**ecarinata pima** Schuster. Ariz.

*Ephuta ecarinata pima* Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 26 (in key). ♂.

Taxonomy: Schuster, 1957. N. Y. Ent. Soc., Jour. 64: 51 (male description).

**eurygnathus** Schuster. N. C. (Southern Pines).

*Ephuta eurygnathus* Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 29 (in key), fig. 11. ♂.

**floridana dietrichi** Schuster. Ala., Miss.

*Ephuta floridana dietrichi* Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 32 (in key), figs. 35, 36. ♀.

Taxonomy: Schuster, 1957. N. Y. Ent. Soc., Jour. 64: 40 (female description).

**floridana floridana** Schuster. Fla.

*Ephuta floridana floridana* Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 25, 32 (in key). ♂, ♀.

Taxonomy: Schuster, 1957. N. Y. Ent. Soc., Jour. 64: 34 (male, female description).

**grisea fuscosericea** Schuster. Alta., Mont., Utah, N. Dak.

*Ephuta grisea fuscosericea* Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 27 (in key), figs. 14, 15, 42. ♂.

Taxonomy: Schuster, 1957. N. Y. Ent. Soc., Jour. 64: 14 (male description).

**grisea grisea** Bradley. Colo. The opposite sex is possibly *coloradella* Schuster.

*Ephuta grisea* Bradley, 1916. Amer. Ent. Soc., Trans. 42: 194. ♂.

Taxonomy: Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 27, fig. 21 (reduced to subsp. rank).

—Schuster, 1957. N. Y. Ent. Soc., Jour. 64: 13 (male description).

**margueritae margueritae** Schuster. Fla.

*Ephuta margueritae margueritae* Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 25, 30 (in key), figs. 17, 46. ♂, ♀.

Taxonomy: Schuster, 1957. N. Y. Ent. Soc., Jour. 64: 56 (male, female description).

**margueritae xanthocephala** Schuster. Pa., N. C., Tenn. Host: "cocoons under stones", presumably mud cells of *Phanagenia bombycina* (Cr.) or of a species of *Auplopus*.

*Ephuta margueritae xanthocephala* Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 25, 30 (in key), figs. 25, 46. ♂, ♀.

Taxonomy: Schuster, 1957. N. Y. Ent. Soc., Jour. 64: 63 (male, female description).

Biology: Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 14 (rearing note).

**minuta minuta** Schuster. Tex. (Brownsville, Fedor, College Sta.). Possibly the opposite sex of *cephalotes* Schuster.

*Ephuta minuta minuta* Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 33 (in key). ♀.

Taxonomy: Schuster, 1957. N. Y. Ent. Soc., Jour. 64: 71 (tentative sex association).

**minuta modesta** Schuster. Ariz. (Tempe).

*Ephuta minuta modesta* Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 32 (in key), figs. 31, 32. ♀.

**pauquilla pauquilla** Bradley. Minn. to Ala., east to Maine and Fla. Host: *Dipogon s. sayi* Bks.

Almost certainly the male of *puteola* (Blake).

*Ephuta pauquilla* Bradley, 1916. Amer. Ent. Soc., Trans. 42: 197. ♂.

Taxonomy: Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 29, figs. 1, 12, 37, 43 (in key; reduced to subsp. rank).

Biology: Evans and Yoshimoto, 1962. Ent. Soc. Amer., Misc. Pub. 3: 104 (host record).

**pauquilla texanella** Schuster. Tex., La., Miss.

*Ephuta pauquilla texanella* Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 29 (in key), figs. 13, 43. ♂.

**psephenophila** Schuster. Ga. (Stone Mt.) The opposite sex is possibly *tentativa* Schuster.

*Ephuta psephenophila* Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 25 (in key). ♂.

- Ephuta ocellaria* Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 36, fig. 18. MS name changed to *psephenophila* (teste R. M. Schuster).
- Taxonomy: Schuster, 1957. N. Y. Ent. Soc., Jour. 64: 44 (male description; tentative sex association).
- puteola* (Blake). Mass. south to Fla., west to Iowa, Tex. Possibly the opposite sex of *p. pauxilla* Brad.
- Mutilla puteola* Blake, 1879. Amer. Ent. Soc., Trans. 7: 252. ♀.
- Taxonomy: Schuster, 1957. N. Y. Ent. Soc., Jour. 64: 40 (female description in key; putative sex association).
- rufisquamis* (Andre). Ariz., south Calif. The opposite sex is possibly *tumacacori* Schuster.
- Rhopromutilla rufisquamis* Andre, 1905. Ztschr. System. Hym. Dipt. 5: 366. ♂.
- Taxonomy: Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 24 (in key). —Schuster, 1957. N. Y. Ent. Soc., Jour. 64: 65 (male description; tentative sex association).
- sabaliana fattigi* Schuster. Ga. (Tifton).
- Ephuta sabaliana fattigi* Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 28 (in key). ♂.
- sabaliana sabaliana* Schuster. Fla. Host: *Anoplius fraternus* (Bks.)?
- Ephuta sabaliana sabaliana* Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 28 (in key). ♂.
- Biology: Krombein, 1955. Ent. Soc. Wash. Proc. 57: 225-226.
- scrupea* (Say). N. J. south to Ga. and Ala., Mich., Wis., Ohio, W. Va., Mo., Ark., Tex. Host: *Phanagenia bombycina* (Cr.).
- Mutilla (Ephuta) scrupea* Say, 1836. Boston Jour. Nat. Hist. 1: 297. ♂.
- Taxonomy: Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 25, 34, figs. 2-4, 27-30, 42 (male, female in key). —Schuster, 1957. N. Y. Ent. Soc., Jour. 64: 26 (male, female description).
- slossonae monochroa* Schuster. Tex. (Rock Island).
- Ephuta slossonae monochroa* Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 34 (in key). ♀.
- slossonae slossonae* (Fox). Fla.
- Mutilla Slossonae* Fox, 1899. Amer. Ent. Soc., Trans. 25: 273. ♂.
- Taxonomy: Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 34 (in key; reduced to subsp. rank).
- spinifera* Schuster. N. J. to Ga.
- Ephuta spinifera* Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 27, 34 (in key). ♂, ♀.
- stenognatha psephenophora* Schuster. North. Fla.
- Ephuta stenognatha psephenophora* Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 28. ♂.
- stenognatha stenognatha* Schuster. Cent. and south. Fla.
- Ephuta stenognatha stenognatha* Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 28 (in key), figs. 7, 8. ♂.
- sudatrix* (Melander). Tex. (Fedor). Possibly the opposite sex of *ecarinata ecarinata* Schuster.
- Mutilla sudatrix* Melander, 1903. Amer. Ent. Soc., Trans. 29: 325. ♀.
- Taxonomy: Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 30 (in key). —Schuster, 1957. N. Y. Ent. Soc., Jour. 64: 54 (female description; tentative sex association).
- tegulicia* Bradley. Tex., Ariz. Possibly a syn. or subsp. of *idiasta* (Cameron) from Mexico.
- Ephuta tegulicia* Bradley, 1916. Amer. Ent. Soc., Trans. 42: 193. ♂.
- Taxonomy: Schuster, 1957. N. Y. Ent. Soc., Jour. 64: 47 (male description).
- tentativa* Schuster. Ga. (Atlanta, Ochlochnee). Possibly the opposite sex of *psephenophila* Schuster.
- Ephuta tentativa* Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 34 (in key). ♀.
- Taxonomy: Schuster, 1957. N. Y. Ent. Soc., Jour. 64: 42 (female description; tentative sex association).
- tumacacori* Schuster. Ariz. (Tumacacori Mts.). Possibly the opposite sex of *rufisquamis* (Andre).
- Ephuta tumacacori* Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 30 (in key). ♀.
- Taxonomy: Schuster, 1957. N. Y. Ent. Soc., Jour. 64: 82 (female description; tentative sex association).

**Genus EPHUTA Subgenus XENOCHILE Schuster**

*Ephuta* subg. *Xenochile* Schuster, 1957. N. Y. Ent. Soc., Jour. 64: 8.

Type-species: *Ephuta (Xenochile) krombeini* Schuster. Orig. design.

**krombeini** Schuster. Ariz. (Ramsey Canyon in Huachuca Mts.).

*Ephuta (Xenochile) krombeini* Schuster, 1957. N. Y. Ent. Soc., Jour. 64: 9. ♂.

**SUBFAMILY SPHAEROPHTALMINAE**

Taxonomy: Ferguson, 1967. Brigham Young Univ. Sci. Bul., Biol. Ser. 8, no. 4: 1-26, 7 figs. (males of Nevada Test Site).

**TRIBE SPHAEROPHTALMINI**

Taxonomy: Schuster, 1958. Ent. Amer. (n. s.) 37: 1-130, 7 pls. (Part II of a tribal revision of males containing keys to genera and subgenera and revisions of *Acrophotopsis* Schuster, *Dilophotopsis* Schuster and *Acanthophotopsis* Schuster).

The majority of species in this tribe are nocturnal, but all members of *Morsyma* Fox, *Sphaerophthalma* subg. *Sphaerophthalma* Blake, and *Protophotopsis* Schuster, and most species of *Photomorphus* subg. *Photomorphus* Viereck, are diurnal.

**Genus MORSYMA Fox**

*Morsyma* Fox, 1899. Amer. Ent. Soc., Trans. 25: 287.

Type-species: *Morsyma Ashmeadii* Fox. Orig. design.

**ashmeadii** Fox. Calif.

*Morsyma Ashmeadii* Fox, 1899. Amer. Ent. Soc., Trans. 25: 287. "♀" = ♂.

Taxonomy: Krombein, 1940. Amer. Ent. Soc., Trans. 65: 420.

**Genus ACROPHOTOPSIS Schuster**

*Acrophotopsis* Schuster, 1958. Ent. Amer. (n. s.) 37: 4 (in key), 61.

Type-species: *Acrophotopsis eurygnathus* Schuster. Orig. design.

**campylognathus** Schuster. Calif. (Riverside Co.); Mexico (Baja California).

*Acrophotopsis campylognathus* Schuster, 1958. Ent. Amer. (n. s.) 37: 11 (in key), 69. ♂.

**eurygnathus** Schuster. Ariz., Nev.

*Acrophotopsis eurygnathus* Schuster, 1958. Ent. Amer. (n. s.) 37: 10 (in key), 65, pl. 1, figs. 1, 2. ♂.

**Genus DILOPHOTOPSIS Schuster**

*Dilophotopsis* Schuster, 1958. Ent. Amer. (n. s.) 37: 5 (in key), 71.

Type-species: *Mutilla concolor* Cresson. Orig. design.

**concolor concolor** (Cresson). Kans. to Colo. and Wyo., Tex., N. Mex., Ariz.; Mexico (Zacatecas, Durango, Jalisco).

*Mutilla concolor* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 390. ♂.

*Odontophotopsis alamonis* Viereck, 1904. Amer. Ent. Soc., Trans. 30: 87. ♂.

Taxonomy: Schuster, 1958. Ent. Amer. (n. s.) 37: 84 (reduction to subsp. rank and syn.).

**concolor crassa** (Viereck). B. C., Mont., southwest. Idaho, west. Colo., Nev., Utah, Ariz., Calif., Wash.

*Odontophotopsis crassus* Viereck, 1924. Canad. Ent. 56: 112. ♂.

*Dilophotopsis concolor utahensis* Schuster, 1958. Ent. Amer. (n. s.) 37: 84 (in key), 87. ♂.

Taxonomy: Ferguson, 1967. Brigham Young Univ. Sci. Bul., Biol. Ser. 8, no. 4: 8 (synonymy).

**concolor laredo** Schuster. Tex. (Winterhaven, Laredo, Cotulla).

*Dilophotopsis concolor laredo* Schuster, 1958. Ent. Amer. (n. s.) 37: 84 (in key), 86. ♂.

**concolor paron** (Cameron). Nev., Ariz., Calif.; Mexico (Sonora, Baja California).

*Sphaerophthalma* (!) *paron* Cameron, 1896. Biol. Cent.-Amer., Hym., v. 2, p. 381. ♂.

*Dilophotopsis concolor sonorensis* Schuster, 1958. Ent. Amer. (n. s.) 37: 84 (in key), 88. ♂.

Taxonomy: Mickel, 1965. Ent. Soc. Wash., Proc. 67: 1 (synonymy).

*stenognatha* Schuster. Ariz. (Tucson).

*Dilophotopsis stenognatha* Schuster, 1958. Ent. Amer. (n. s.) 37: 11 (in key), 74. ♂.

Taxonomy: Mickel, 1963. Pan-Pacific Ent. 39: 184 (female description).

### Genus ACANTHOPHOTOPSIS Schuster

*Acanthophotopsis* Schuster, 1958. Ent. Amer. (n. s.) 37: 5 (in key), 88.

Type-species: *Acanthophotopsis falciformis* Schuster. Orig. desig.

*bequaertii* Schuster. Ariz. (Hereford).

*Acanthophotopsis bequaertii* Schuster, 1958. Ent. Amer. (n. s.) 37: 12 (in key), 101. ♂.

*bifurca* Schuster. Okla., Tex., N. Mex.

*Acanthophotopsis bifurca* Schuster, 1958. Ent. Amer. (n. s.) 37: 13 (in key), 98, pl. 3, fig. 3. ♂.

*dorophora* Schuster. Ariz. (Tucson, Yuma).

*Acanthophotopsis dorophora* Schuster, 1958. Ent. Amer. (n. s.) 37: 13 (in key), 104, pl. 2, fig. 1, pl. 3, fig. 2. ♂.

*evansii* Schuster. Tex. (Alpine and Chisos Mts.); Mexico (Durango).

*Acanthophotopsis evansii* Schuster, 1958. Ent. Amer. (n. s.) 37: 12 (in key), 93, pl. 3, fig. 1. ♂.

*falciformis falciformis* Schuster. Nev., Calif.; Mexico (Zacatecas).

*Acanthophotopsis falciformis falciformis* Schuster, 1958. Ent. Amer. (n. s.) 37: 13 (in key), 108, pl. 2, figs. 2, 3. ♂.

*falciformis furcisterna* Schuster. Ariz. (Tucson, Phoenix, Ajo).

*Acanthophotopsis falciformis furcisterna* Schuster, 1958. Ent. Amer. (n. s.) 37: 14 (in key), 111. ♂.

### Genus SPHAEROPHTALMA Blake

In addition to the host records cited under several species in this genus, Parker and Bohart, 1968 (Pan-Pacific Ent. 44: 2) record an unidentified species of *Sphaerophthalma* from a twig nest of *Leptochilus washo* Parker, and Hurd and Powell, 1958 (Pan-Pacific Ent. 34: 152-153) record an unidentified female of this species as leaving a burrow of *Colletes stepheni* Timb.

### Genus SPHAEROPHTALMA Subgenus MICROMUTILLA Ashmead

*Micromutilla* Ashmead, 1899. N. Y. Ent. Soc., Jour. 7: 59.

Type-species: *Photopsis nanus* Ashmead. Orig. desig.

*acontia* (Fox). N. Mex., Ariz., Nev.

*Photopsis nanus* Ashmead, 1896. Amer. Ent. Soc., Trans. 23: 181. ♂. Preocc.

*Mutilla acontius* Fox, 1899. Amer. Ent. Soc., Trans. 25: 266. ♂.

*Mutilla Ashmeadii* Fox, 1899. Amer. Ent. Soc., Trans. 25: 289. N. name.

Taxonomy: Ferguson, 1967. Brigham Young Univ. Sci. Bul., Biol. Ser. 8, no. 4: 9 (synonymy).

*becki* Ferguson. Calif.

*Sphaerophthalma (Micromutilla) becki* Ferguson, 1967. Brigham Young Univ. Sci. Bul., Biol. Ser. 8, no. 4: 9, fig. 5. ♂.

*bellerophon* (Fox). Tex., N. Mex., Ariz.

*Mutilla bellerophon* Fox, 1899. Amer. Ent. Soc., Trans. 25: 254. ♂.

*brachyptera* Schuster. Calif., Nev., Ariz.; Mexico (Sonora).

*Photopsis brachyptera* Schuster, 1945. Pan-Pacific Ent. 21: 149. ♂.

*Sphaerophthalma (Micromutilla) yavapai* Schuster, 1958. Ent. Amer. (n. s.) 37: 19. ♂.

Taxonomy: Ferguson, 1967. Brigham Young Univ. Sci. Bul., Biol. Ser. 8, no. 4: 11 (synonymy).

*difficilis* (Baker). Calif., Nev., Ariz., N. Mex.; Mexico (Baja California). Host: *Auplopus arctictus metallicus* (Bks.).

*Photopsis difficilis* Baker, 1905. Invertebrata Pacifica 1: 114. ♂.

*Sphaerophthalma (Micromutilla) maricopella purismella* Schuster, 1958. Ent. Amer. (n. s.) 37: 17. ♂.

- Sphaerophthalma* (*Micromutilla*) *maricopella maricopella* Schuster, 1958. Ent. Amer. (n. s.) 37: 17. ♂.
- Sphaerophthalma* (*Micromutilla*) *maricopella castanea* Schuster, 1958. Ent. Amer. (n. s.) 37: 17. ♂.
- Sphaerophthalma* (*Micromutilla*) *californiense californiense* Schuster, 1958. Ent. Amer. (n. s.) 37: 18. ♂.
- Sphaerophthalma* (*Micromutilla*) *californiense fuscata* Schuster, 1958. Ent. Amer. (n. s.) 37: 18. ♂.
- Sphaerophthalma* (*Micromutilla*) *quijotoa quijotoa* Schuster, 1958. Ent. Amer. (n. s.) 37: 18. ♂.
- Sphaerophthalma* (*Micromutilla*) *quijotoa parrasia* Schuster, 1958. Ent. Amer. (n. s.) 37: 18. ♂.
- Taxonomy: Ferguson, 1967. Brigham Young Univ. Sci. Bul., Biol. Ser. 8, no. 4: 11 (synonymy).
- Biology: Ferguson, 1962. Univ. Calif. Pubs. Ent. 27: tab. 10 (host record).
- hyalina** (Blake). Tex.  
*Agama hyalina* Blake, 1871. Amer. Ent. Soc., Trans. 3: 263. ♂.  
*Agama minuta* Blake, 1872. Amer. Ent. Soc., Trans. 4: 76. ♂.
- macswaini** Ferguson. Nev., Calif.  
*Sphaerophthalma* (*Micromutilla*) *macswaini* Ferguson, 1967. Brigham Young Univ. Sci. Bul., Biol. Ser. 8, no. 4: 12, fig. 6. ♂.
- mesillensis** (Cockerell). N. Mex. (Mesilla).  
*Photopsis mesillensis* Cockerell, 1897. Entomologist 30: 137. ♂.
- pallida** (Blake). Tex., N. Mex., Ariz., Nev.  
*Agama pallida* Blake, 1871. Amer. Ent. Soc., Trans. 3: 263. ♂.  
*Sphaerophthalma* (*Micromutilla*) *arizonae* Schuster, 1958. Ent. Amer. (n. s.) 37: 16. ♂.
- Taxonomy: Ferguson, 1967. Brigham Young Univ. Sci. Bul., Biol. Ser. 8, no. 4: 13 (synonymy).
- parapenalis** Ferguson. Wash., Oreg., Idaho, Calif., Nev., Utah, Ariz., Tex.; Mexico (Chihuahua, Coahuila, Durango, Zacatecas).  
*Sphaerophthalma* (*Micromutilla*) *parapenalis* Ferguson, 1967. Brigham Young Univ. Sci. Bul., Biol. Ser. 8, no. 4: 14, fig. 7. ♂.
- pateli** Schuster. Ariz. (Hereford).  
*Sphaerophthalma* (*Micromutilla*) *pateli* Schuster, 1958. Ent. Amer. (n. s.) 37: 15. ♂.
- reducta** Schuster. Ariz.  
*Sphaerophthalma* (*Micromutilla*) *reducta* Schuster, 1958. Ent. Amer. (n. s.) 37: 18. ♂.
- sabino** Schuster. Ariz.  
*Sphaerophthalma* (*Micromutilla*) *sabino* Schuster, 1958. Ent. Amer. (n. s.) 37: 19. ♂.
- sonora** Schuster. Ariz., Nev., Calif.  
*Sphaerophthalma* (*Micromutilla*) *sonora* Schuster, 1958. Ent. Amer. (n. s.) 37: 16. ♂.
- sublobata** Schuster. Idaho.  
*Sphaerophthalma* (*Micromutilla*) *sublobata* Schuster, 1958. Ent. Amer. (n. s.) 37: 16. ♂.
- uvaldella** Schuster. Tex.  
*Sphaerophthalma* (*Micromutilla*) *uvaldella* Schuster, 1958. Ent. Amer. (n. s.) 37: 19. ♂.
- yumaella** Schuster. Nev., Ariz., Calif.; Mexico (Baja California).  
*Sphaerophthalma* (*Micromutilla*) *yumaella* Schuster, 1958. Ent. Amer. (n. s.) 37: 19. ♂.
- Genus SPHAEROPHTHALMA Subgenus PHYSETAPSIS Schuster**
- Sphaerophthalma* subg. *Physetapsis* Schuster, 1958. Ent. Amer. (n. s.) 37: 9 (in key), 20.  
Type-species: *Sphaerophthalma* (*Physetapsis*) *papaga* Schuster. Orig. desig.
- borealis** Schuster. Sask.  
*Sphaerophthalma* (*Physetapsis*) *borealis* Schuster, 1958. Ent. Amer. (n. s.) 37: 20. ♂.
- ecarinata** Schuster. Calif.  
*Sphaerophthalma* (*Physetapsis*) *ecarinata* Schuster, 1958. Ent. Amer. (n. s.) 37: 20. ♂.

**papaga ephyesetos** Schuster. Southwestern Ariz., southern Calif.

*Sphaerophthalma (Phyetapsis) papaga ephyesetos* Schuster, 1958. Ent. Amer. (n. s.) 37: 20. ♂.

**papaga papaga** Schuster. Southeastern Ariz., Calif. (Imperial Co.).

*Sphaerophthalma (Phyetapsis) papaga papaga* Schuster, 1958. Ent. Amer. (n. s.) 37: 20, pl. 6, fig. 3. ♂.

**subcarinata** Schuster. N. Mex.

*Sphaerophthalma (Phyetapsis) subcarinata* Schuster, 1958. Ent. Amer. (n. s.) 37: 20. ♂.

**Genus SPHAEROPHTHALMA Subgenus PHOTOPSIS** Blake

*Agama* Blake, 1871. Amer. Ent. Soc., Trans. 3: 258. Preocc.

Type-species: *Agama imperialis* Blake. Automatic desig. by Ashmead, 1899.

*Photopsis* Blake, 1886. Amer. Ent. Soc., Trans. 13: 179. N. name.

Type-species: *Agama imperialis* Blake. Desig. by Ashmead, 1899.

*Pyrrhomutilla* Ashmead, 1899. N. Y. Ent. Soc., Jour. 7: 56.

Type-species: *Sphaerophthalma (!) anthophorae* Ashmead. Orig. desig.

*Neophotopsis* Ashmead, 1903. Canad. Ent. 35: 306.

Type-species: *Mutilla pluto* Fox. Orig. desig.

In addition to the host records cited under several species in this subgenus, Parker and Bohart, 1968 (Pan-Pacific Ent. 44: 2, 3 and 5) record several unidentified species of *Sphaerophthalma* (*Photopsis*) from the following hosts from nests in twigs: *Ancistrocerus cat-skill* (Sauss.); *Odynerus erythrogaster* Bohart; *Pisonopsis birkmanni* Rohwer; *Anthocopa hypostomalis* Michener; *Hoplitis fulgida* (Cresson); *H. sambuci* Titus; and *Proterias bullifacies* (Michener). Ferguson, 1962 (Univ. Calif. Pubs. Ent. 27: tab. 9) states that Davidson reared an unidentified species of *Sphaerophthalma* (*Photopsis*) from a nest of *Hoplitis producta* (Cresson) in a hollow plant stem.

Biology: Ferguson, 1962. Univ. Calif. Pubs. Ent. 27: 1-92, 7 pls., 2 text figs. (life history, hosts).

**albopilosa** (Blake). Tex. (Comal Co.).

*Mutilla (Sphaerophthalma) albopilosa* Blake, 1872. Amer. Ent. Soc., Trans. 4: 74. ♀.

**anaspasia** (Cockerell and Rohwer). Colo. (Boulder).

*Photopsis anaspasia* Cockerell and Rohwer, 1908. Psyche 15: 5. ♀.

**angulifera** Schuster. Calif., Nev.

*Sphaerophthalma (Photopsis) angulifera* Schuster, 1958. Ent. Amer. (n. s.) 37: 32. ♂.

Taxonomy: Ferguson, 1967. Brigham Young Univ. Sci. Bul., Biol. Ser. 8, no. 4: 17 (distribution).

**arenicola** Schuster. Ariz.

*Sphaerophthalma (Photopsis) arenicola* Schuster, 1958. Ent. Amer. (n. s.) 37: 25. ♂.

**arota** (Cresson). Calif. (San Diego).

*Mutilla Arota* Cresson, 1875. Amer. Ent. Soc., Trans. 5: 120. ♀.

**baboquivari** Schuster. Ariz.

*Sphaerophthalma (Photopsis) baboquivari* Schuster, 1958. Ent. Amer. (n. s.) 37: 24, pl. 4, figs. 1-6. ♂.

**bisetosa** Schuster. Tex., N. Mex., Ariz.

*Sphaerophthalma (Photopsis) bisetosa* Schuster, 1958. Ent. Amer. (n. s.) 37: 36. ♂.

**blakeii** (Fox). Nev., Ariz., N. Mex., Calif.; Mexico (Baja California). Host: *Diadasia vallicola* Timb.

*Photopsis Blakeii* Fox, 1893. Calif. Acad. Sci., Proc. (2) 4: 6. ♂.

*Mutilla Gautschii* Dalla Torre, 1897. Cat. Hym. 8: 43. N. name erroneously proposed for *blakeii* Fox, thought to be preocc. by Cameron, 1894.

*Mutilla ceyx* Fox, 1899. Amer. Ent. Soc., Trans. 25: 262. ♂.

Taxonomy: Ferguson, 1967. Brigham Young Univ. Sci. Bul., Biol. Ser. 8, no. 4: 17 (synonymy).

Biology: Ferguson, 1962. Univ. Calif. Pubs. Ent. 27: 10-15, pls. 2, 3, 4, 5, 7, tab. 9 (life history).

**capricornis** (Rohwer). Colo. (Boulder).

*Photopsis capricornis* Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 131. ♀.

**ceres** (Fox). Ariz., Colo., Utah.

*Mutilla ceres* Fox, 1899. Amer. Ent. Soc., Trans. 25: 257. ♀.

**ceyxoides** Schuster. Ariz.

*Sphaerophthalma* (*Photopsis*) *ceyxoides* Schuster, 1958. Ent. Amer. (n. s.) 37: 25. ♂.

**clara clara** (Cresson). N. Mex., Colo. to Wyo. and Idaho. This subsp. is transitional to *Sphaerophthalma* subg. *Phyetapsis* Schuster.

*Mutilla clara* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 439. ♂.

Taxonomy: Schuster, 1958. Ent. Amer. (n. s.) 37: 27.

**clara cleomella** Schuster. Mont. This subsp. is transitional to *Sphaerophthalma* subg.

*Phyetapsis* Schuster.

*Sphaerophthalma* (*Photopsis*) *clara cleomella* Schuster, 1958. Ent. Amer. (n. s.) 37: 27. ♂.

**coaequalis** Cameron. Mont. and Oreg. to N. Mex. and north. Ariz., Kans., Tex.; north. Mexico.

*Sphaerophthalma* (!) *coaequalis* Cameron, 1896. Biol. Cent.-Amer., Hym., v. 2, p. 379. ♂.

*Mutilla albicincta* Fox, 1899. Amer. Ent. Soc., Trans. 25: 255. ♂.

*Sphaerophthalma* (*Photopsis*) *albicincta piceiceps* Schuster, 1958. Ent. Amer. (n. s.) 37: 35. ♂.

*Sphaerophthalma* (*Photopsis*) *albicincta flavipes* Schuster, 1958. Ent. Amer. (n. s.) 37: 36. ♂.

Taxonomy: Mickel, 1965. Ent. Soc. Wash., Proc. 67: 1 (synonymy).

**danaus** (Blake). Kans., Tex., N. Mex.; Mexico.

*Agama Danaus* Blake, 1871. Amer. Ent. Soc., Trans. 3: 261. ♂.

**dentifera** Schuster. S. Dak., Minn.

*Sphaerophthalma* (*Photopsis*) *dentifera* Schuster, 1958. Ent. Amer. (n. s.) 37: 24. ♂.

**diomeda** (Fox). Tex.

*Mutilla diomeda* Fox, 1899. Amer. Ent. Soc., Trans. 25: 257. ♀.

**dirce** (Fox). Ariz., Utah, Tex.

*Mutilla dirce* Fox, 1899. Amer. Ent. Soc., Trans. 25: 258. ♀.

**edwardsii edwardsii** (Cresson). Oreg., Idaho.

*Mutilla Edwardsii* Cresson, 1875. Amer. Ent. Soc., Trans. 5: 119. ♂.

**edwardsii flammifera** Schuster. Calif.

*Sphaerophthalma* (*Photopsis*) *edwardsii flammifera* Schuster, 1958. Ent. Amer. (n. s.) 37: 36. ♂.

**erato** (Blake). Tex.

*Mutilla Erato* Blake, 1879. Amer. Ent. Soc., Trans. 7: 251. ♀.

**erigone** (Fox). Colo.

*Mutilla erigone* Fox, 1899. Amer. Ent. Soc., Trans. 25: 268. ♀.

**facilis** (Cameron). N. Mex., Ariz.; Mexico (Durango).

*Sphaerophthalma* (!) *facilis* Cameron, 1896. Biol. Cent.-Amer., Hym., v. 2, p. 392. ♂.

*Mutilla Hubbardii* Fox, 1899. Amer. Ent. Soc., Trans. 25: 256. ♂.

*Sphaerophthalma* (*Photopsis*) *piceogaster* Schuster, 1958. Ent. Amer. (n. s.) 37: 27. ♂.

**ferruginea** (Blake). Nev., Calif. Host: *Isodontia elegans* (Smith).

*Agama ferruginea* Blake, 1879. Amer. Ent. Soc., Trans. 7: 254. ♂.

*Mutilla ferruginosa* Dalla Torre, 1897. Cat. Hym., v. 8, p. 40. N. name for *Agama ferruginea* Blake, not *Mutilla ferruginea* Smith.

Biology: Davidson, 1899. Ent. News 10: 180 (host).

**ferruginopsis** Schuster. Ariz., Calif.

*Sphaerophthalma* (*Photopsis*) *ferruginopsis* Schuster, 1958. Ent. Amer. (n. s.) 37: 29. ♂.

**fuscipes** Schuster. Ariz.; Mexico (Durango). This sp. is transitional to *Sphaerophthalma* subg. *Phyetapsis* Schuster.

*Sphaerophthalma* (*Photopsis*) *fuscipes* Schuster, 1958. Ent. Amer. (n. s.) 37: 21. ♂.

**halcyone** (Fox). Kans. (Hamilton Co.).

*Mutilla halcyone* Fox, 1899. Amer. Ent. Soc., Trans. 25: 257. ♀.

- helicaon** (Fox). Nev., Ariz., Calif.; Mexico (Baja California, Coahuila).  
*Mutilla helicaon* Fox, 1899. Amer. Ent. Soc., Trans. 25: 254. ♂.  
*Photopsis lingulatus* Viereck, 1903. Acad. Nat. Sci. Phila., Proc. 54: 737. ♂.  
*Sphaerophthalma* (*Photopsis*) *carinata* Schuster, 1958. Ent. Amer. (n. s.) 37: 34. ♂.  
*Sphaerophthalma* (*Photopsis*) *helicaon coahuilae* Schuster, 1958. Ent. Amer. (n. s.) 37: 34. ♂.  
*Sphaerophthalma* (*Photopsis*) *helicaon diegueno* Schuster, 1958. Ent. Amer. (n. s.) 37: 35. ♂.  
 Taxonomy: Ferguson, 1967. Brigham Young Univ. Sci. Bul., Biol. Ser. 8, no. 4: 17 (synonymy).
- hypermnestra** (Fox). Calif. (Poway).  
*Mutilla hypermnestra* Fox, 1899. Amer. Ent. Soc., Trans. 25: 268. ♀.
- ignacio** Schuster. Southern Calif.; Mexico (Baja California).  
*Sphaerophthalma* (*Photopsioides*) *amphion ignacio* Schuster, 1958. Ent. Amer. (n. s.) 37: 38. ♂.
- imperialiformis imperialiformis** (Viereck). Tex. to Kans. and Colo.  
*Mutilla* (*Photopsis*) *imperialiformis* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 189. ♂.
- imperialiformis maricopae** Schuster. Ariz. to Wash.  
*Sphaerophthalma* (*Photopsis*) *imperialiformis maricopae* Schuster, 1958. Ent. Amer. (n. s.) 37: 34. ♂.
- imperialis** (Blake). Tex.  
*Agama imperialis* Blake, 1871. Amer. Ent. Soc., Trans. 3: 260. ♂.
- insignis** (Baker). Calif. (Claremont); Mexico (Baja California).  
*Photopsis insignis* Baker, 1905. Invertebrata Pacifica 1: 115. ♂.
- jacala** Schuster. Ariz.; Mexico (Jacala).  
*Sphaerophthalma* (*Photopsis*) *jacala* Schuster, 1958. Ent. Amer. (n. s.) 37: 21. ♂.
- juxta** (Blake). Iowa, Kans., Tex., N. Mex., Ariz.  
*Agama juxta* Blake, 1872. Amer. Ent. Soc., Trans. 4: 76. ♂.  
 Taxonomy: Ferguson, 1967. Brigham Young Univ. Sci. Bul., ser. 8, no. 4: 15.
- laodamia** (Fox). Ariz.  
*Mutilla laodamia* Fox, 1899. Amer. Ent. Soc., Trans. 25: 258. ♀.
- luiseno** Schuster. Calif.  
*Sphaerophthalma* (*Photopsis*) *luiseno* Schuster, 1958. Ent. Amer. (n. s.) 37: 23. ♂.
- marpesia** (Blake). Kans., Utah.  
*Mutilla Marpesia* Blake, 1879. Amer. Ent. Soc., Trans. 7: 247. ♀.  
*Sphaerophthalma* (!) *luteola* Blake, 1886. Amer. Ent. Soc., Trans. 13: 235. ♀.
- megagnathos aurifera** Schuster. Calif., Ariz.  
*Sphaerophthalma* (*Photopsis*) *megagnathos auriferus* Schuster, 1958. Ent. Amer. (n. s.) 37: 36. ♂.
- megagnathos megagnathos** Schuster. Calif., Ariz.  
*Sphaerophthalma* (*Photopsis*) *megagnathos megagnathos* Schuster, 1958. Ent. Amer. (n. s.) 37: 36. ♂.
- militaris** Schuster. Ariz., Calif.  
*Sphaerophthalma* (*Photopsis*) *militaris* Schuster, 1958. Ent. Amer. (n. s.) 37: 27, pl. 5, fig. 2. ♂.
- minutella** (Mickel). Calif. (Lassen Co.).  
*Photopsis minutella* Mickel, 1938. Pan-Pacific Ent. 14: 183. ♀.
- nanula** (Dalla Torre). Tex., Colo., Nev., Idaho. Host: *Tachysphex* sp.  
*Mutilla pygmaea* Blake, 1879. Amer. Ent. Soc., Trans. 7: 250. ♀. Preocc.  
*Mutilla nanula* Dalla Torre, 1897. Cat. Hym., v. 8, p. 65. N. name.  
*Mutilla pygmaea* (!) Dalla Torre, 1897. Cat. Hym., v. 8, p. 65.  
 Biology: Krombein, 1958. U. S. Dept. Agr., Monog. 2, Sup. 1: 102 (host).
- neomexicana** Schuster. N. Mex.  
*Sphaerophthalma* (*Photopsis*) *neomexicana* Schuster, 1958. Ent. Amer. (n. s.) 37: 30. ♂.
- noctivaga** (Melander). Nebr. and Wyo. south to Tex. and Ariz.  
*Mutilla noctivaga* Melander, 1903. Amer. Ent. Soc., Trans. 29: 318. ♂.



- Sphaerophthalma (Photopsis) noctivaga infusca* Schuster, 1958. Ent. Amer. (n. s.) 37: 32. ♂.
- nokomis nokomis** (Blake). Ariz.  
*Agama Nokomis* Blake, 1871. Amer. Ent. Soc., Trans. 3: 260. ♂.
- nokomis ruficeps** Schuster. Ariz.  
*Sphaerophthalma (Photopsis) nokomis ruficeps* Schuster, 1958. Ent. Amer. (n. s.) 37: 35. ♂.
- ordae** Schuster. Tex.  
*Sphaerophthalma (Photopsis) ordae* Schuster, 1958. Ent. Amer. (n. s.) 37: 23. ♂.
- orestes** (Fox). Wash. to Calif., Nev.; Mexico (Baja California). Host: *Anthidium c. collectum* Huard; *Eudynerus a. auranus* (Cam.); *Tachysphex tenuipunctus* Fox.  
*Mutilla orestes* Fox, 1899. Amer. Ent. Soc., Trans. 25: 256. ♂.  
*Mutilla Pattersonae* Melander, 1903. Amer. Ent. Soc., Trans. 29: 309. ♂.  
*Photopsis indigens* Baker, 1905. Invertebrata Pacifica 1: 112. ♂.  
*Photopsis uniformis* Baker, 1905. Invertebrata Pacifica 1: 113. ♂.  
*Photopsis pedatus* Baker, 1905. Invertebrata Pacifica 1: 115. ♂.  
*Photopsis ingenuus* Baker, 1905. Invertebrata Pacifica 1: 116. ♂.  
*Photopsis salmani* Mickel, 1938. Pan-Pacific Ent. 14: 178. ♀, ♂.  
*Sphaerophthalma (Photopsis) salmani fresnoensis* Schuster, 1958. Ent. Amer. (n. s.) 37: 30. ♂.
- Sphaerophthalma (Photopsis) salmani oregana* Schuster, 1958. Ent. Amer. (n. s.) 37: 31. ♂.
- Taxonomy: Schuster, 1958. Ent. Amer. (n. s.) 37: 30 (synonymy). —Ferguson, 1962. Univ. Calif. Pubs. Ent. 27: 10 (synonymy).
- Biology: Ferguson, 1962. Univ. Calif. Pubs. Ent. 27: 6-10, pls. 1, 6, tabs. 1, 9 (life history).
- pallidipes** Schuster. Ariz.  
*Sphaerophthalma (Photopsis) pallidipes pallidipes* Schuster, 1958. Ent. Amer. (n. s.) 37: 27. ♂.
- Sphaerophthalma (Photopsis) pallidipes gila* Schuster, 1958. Ent. Amer. (n. s.) 37: 28. ♂.
- parkeri** Schuster. Ariz., Calif.  
*Sphaerophthalma (Photopsis) parkeri* Schuster, 1958. Ent. Amer. (n. s.) 37: 28. ♂.
- pervaga** (Melander). Tex. (Fedor).  
*Mutilla pervaga* Melander, 1903. Amer. Ent. Soc., Trans. 29: 321. ♀.
- pinalea** Schuster. N. Dak. to Tex., Ariz.; Mexico (Coahuila, Durango).  
*Sphaerophthalma (Photopsis) pinalea pinalea* Schuster, 1958. Ent. Amer. (n. s.) 37: 32. ♂.  
*Sphaerophthalma (Photopsis) pinalea texanella* Schuster, 1957. Ent. Amer. (n. s.) 37: 32. ♂.
- pinales** Schuster. Ariz.  
*Sphaerophthalma (Photopsis) pinales* Schuster, 1958. Ent. Amer. (n. s.) 37: 36. ♂.
- pluto** (Fox). Tex., N. Mex., Ariz.  
*Mutilla pluto* Fox, 1899. Amer. Ent. Soc., Trans. 25: 255. ♂.  
*Mutilla palamedes* Fox, 1899. Amer. Ent. Soc., Trans. 25: 264. ♂.
- rubriventris** Schuster. Tex., N. Mex., Ariz.; Mexico (Tamaulipas).  
*Sphaerophthalma (Photopsis) facilis rubriventris* Schuster, 1958. Ent. Amer. (n. s.) 37: 26. ♂.
- sanctae feae** (Cockerell). N. Mex. (Santa Fe).  
*Mutilla sanctae-feae* Cockerell, 1897. In Cockerell and Fox, Acad. Nat. Sci. Phila., Proc. 49: 137. ♀.
- scudleri** Schuster. Ariz.  
*Sphaerophthalma (Photopsis) scudleri* Schuster, 1958. Ent. Amer. (n. s.) 37: 23. ♂.
- seminanula** Rohwer. Colo. (Boulder).  
*Photopsis seminanula* Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 130. ♀.
- similis** Schuster. Calif.  
*Sphaerophthalma (Photopsis) similis* Schuster, 1958. Ent. Amer. (n. s.) 37: 30. ♂.
- spinifera** Schuster. Kans., Okla., Colo.  
*Sphaerophthalma (Photopsis) spinifera* Schuster, 1958. Ent. Amer. (n. s.) 37: 23. ♂.
- tetracuspis** Schuster. Calif. (Riverside Co.); Mexico (Baja California).  
*Sphaerophthalma (Photopsis) tetracuspis* Schuster, 1958. Ent. Amer. (n. s.) 37: 31. ♂.

- triangularis** (Blake). Tex., N. Mex., Ariz., Nev., Calif.; Mexico (Baja California).  
*Agama triangularis* Blake, 1871. Amer. Ent. Soc., Trans. 3: 262. ♂.
- tuberculifera** Schuster. Calif. (?).  
*Sphaerophthalma* (*Photopsis*) *tuberculifera* Schuster, 1958. Ent. Amer. (n. s.) 37: 25. ♂.
- unicolor** (Cresson). U. S. west of Rocky Mts.; Mexico (Baja California del Norte). Host:  
*Isodontia elegans* (Sm.); *Anthidium c. collectum* Huard, *Callanthidium illustre* (Cr.),  
*Ashmeadiella c. californica* (Ashm.); *Anthophora abruptella* Ckll., *A. bomboidea*  
*neomexicana* Ckll., *A. linsleyi* Timb., *A. montana* Cr.?, *A. occidentalis* Cr., *Diadasia*  
*bituberculata* (Cr.), *Melissodes robustior* Ckll., *Xeromelecta californica* (Ashm.).  
*Mutilla unicolor* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 389. ♂.  
*Agama mendica* Blake, 1871. Amer. Ent. Soc., Trans. 3: 259. ♂.  
*Mutilla auraria* Blake, 1879. Amer. Ent. Soc., Trans. 7: 248. ♀.  
*Mutilla Aspasia* Blake, 1879. Amer. Ent. Soc., Trans. 7: 250. ♀.  
*Mutilla Phaedra* Blake, 1879. Amer. Ent. Soc., Trans. 7: 251. ♀.  
*Agama rustica* Blake, 1879. Amer. Ent. Soc., Trans. 7: 252. ♂.  
*Photopsis nebulosus* Blake, 1886. Amer. Ent. Soc., Trans. 13: 275. ♂.  
*Sphaerophthalma* (!) *anthophora* Ashmead, 1897. In Davidson, South. Calif. Acad. Sci.,  
Proc. 1: 5. ♀, ♂.  
*Mutilla monochroa* Dalla Torre, 1897. Cat. Hym., v. 8, p. 63. N. name for *Mutilla unicolor*  
Cresson, not *Myrmosa unicolor* Say.  
*Dasytmilla sumneriella* Cockerell, 1915. Entomologist 48: 249. ♀.  
*Sphaerophthalma* (*Photopsis*) *rustica ocellaria* Schuster, 1958. Ent. Amer. (n. s.) 37: 32. ♂.
- Biology: Davidson, 1894. Ent. News 5: 170 (host records). — Davidson, 1897. South. Calif.  
Acad. Sci., Proc. 1: 4-5 (host records). — Davidson, 1899. Ent. News 10: 180 (host record).  
— Linsley and MacSwain, 1942. Amer. Midland Nat. 27: 409 (host records). — Ferguson,  
1962. Univ. Calif. Pubs. Ent. 27: 15-22, pls. 3, 5, 7, tab. 9 (life history, host records).
- virguncula** (Blake). N. Mex.  
*Sphaerophthalma* (!) *virguncula* Blake, 1886. Amer. Ent. Soc., Trans. 13: 253. ♀.
- zenobia** (Blake). Calif., ? Tex.  
*Mutilla zenobia* Blake, 1879. Amer. Ent. Soc., Trans. 7: 250. ♀.
- zephyritis** (Fox). Calif. (Los Angeles).  
*Mutilla zephyritis* Fox, 1899. Amer. Ent. Soc., Trans. 25: 269. ♀.

## NOMEN NUDUM IN SPHAEROPHTHALMA SUBGENUS PHOTOPSIS BLAKE

- Sphaerophthalma* (*Photopsis*) *nixonensis* Parker and Bohart, 1966. Pan-Pacific Ent. 42: 98. Nev.  
Host: *Proteriadess* sp.

## Genus SPHAEROPHTHALMA Subgenus PHOTOSIODES Schuster

- Sphaerophthalma* subg. *Photopsioides* Schuster, 1958. Ent. Amer. (n. s.) 37: 10 (in key), 36.  
Type-species: *Agama uro* Blake. Orig. design.

In addition to the host records cited below under *uro* (Blake), Ferguson, 1962 (Univ. Calif. Pubs. Ent. 27: tab. 10) records *Sceliphron caementarium* (Dru.) as the host of an unidentified species of this subgenus.

- abdominalis** (Blake). Kans., Tex., Colo., Ariz., Utah. Host: *Trypargilum t. tridentatum* (Pack.).  
*Photopsis abdominalis* Blake, 1886. Amer. Ent. Soc., Trans. 13: 275. ♂.  
*Mutilla coloradensis* Dalla Torre, 1897. Cat. Hym., v. 8, p. 25. N. name for *Photopsis*  
*abdominalis* Blake, not *Mutilla abdominalis* Westwood.
- amphion** (Fox). Ariz., Nev., Calif., Oreg.; Mexico (Baja California). Host: *Sapyga aculeata* Cr.;  
*Leptochilus chiricahua* Prkr., *Ancistrocerus c. catskill* (Sauss.); *Trypargilum t.*  
*tridentatum* (Pack.); *Hoplitis bullifacies* Mich., *H. f. fulgida* (Cr.), *H. g. grinnelli* Ckll.,  
*H. hypostomalis* Mich., *H. sambuci* Titus, *Anthocopa copelandica* (Ckll.), *Ashmeadiella*  
*m. meliloti* (Ckll.), *Stelis* spp.  
*Mutilla amphion* Fox, 1899. Amer. Ent. Soc., Trans. 25: 263. ♂.  
*Photopsis abstrusa* Baker, 1905. Invertebrata Pacifica 1: 113. ♂.  
*Photopsis nudata* Baker, 1905. Invertebrata Pacifica 1: 114. ♂.

Taxonomy: Ferguson, 1967. Brigham Young Univ., Sci. Bul., ser. 8, no. 4: 20 (synonymy).

Biology: Parker, 1975. Pan-Pacific Ent. 51: 116 (host).

**contracta** (Blake). Nev., Oreg.

*Agama contracta* Blake, 1879. Amer. Ent. Soc., Trans. 7: 253. ♂.

*Mutilla contrahenda* Dalla Torre, 1897. Cat. Hym., v. 7, p. 27. N. name for *Agama contracta* Blake, not *Mutilla contracta* Say.

**uro** (Blake). Kans., Tex., N. Mex., Ariz. Host: *Pachodynerus astraeus* (Cam.), eumenid sp.;

*Trypargilum t. tridentatum* (Pack.); *Dianthidium curvatum sayi* Ckll.

*Agama uro* Blake, 1879. Amer. Ent. Soc., Trans. 7: 253. ♂.

*Photopsis melanderi* Baker, 1905. Invertebrata Pacifica 1: 112. ♂.

*Sphaerophthalma* (*Photopsioides*) *uro stenognatha* Schuster, 1958. Ent. Amer. (n. s.) 37: 38. ♂.

Biology: Fischer, 1951. Kans. Ent. Soc., Jour. 24: 49 (host record). —Ferguson, 1962. Univ.

Calif. Pubs. Ent. 27: tab. 10 (host records). —Parker and Bohart, 1966. Pan-Pacific Ent. 42:

93 (host record). —Krombein, 1967. Trap-nesting wasps and bees, pp. 478-479 (life history).

### Genus SPHAEROPHTHALMA Subgenus SPHAEROPHTHALMA Blake

*Sphaerophthalma* Blake, 1871. Amer. Ent. Soc., Trans. 3: 232.

Type-species: *Mutilla* (*Sphaerophthalma*) *scaeva* Blake. Automatic desig. by Ashmead, 1899 (= *Sphaerophthalma pensylvanica scaeva* (Blake)).

*Sphaerophthalma* (!) Blake, 1886. Amer. Ent. Soc., Trans. 13: 179. Emend.

Type-species: *Mutilla* (*Sphaerophthalma*) *scaeva* Blake. Desig. by Ashmead, 1899 (= *Sphaerophthalma pensylvanica scaeva* (Blake)).

Revision: Schuster, 1944. Brooklyn Ent. Soc., Bul. 39: 141-147.

**auripilis auripilis** (Blake). Kans., Okla., Tex. Host: *Chalybion californicum* (Sauss.),

*Sceliphron caementarium* (Drury), *Trypoxylon* sp.; solitary eumenid in old clay cell of *Sceliphron*.

*Mutilla* (*Sphaerophthalma*) *auripilis* Blake, 1871. Amer. Ent. Soc., Trans. 3: 233. ♂.

*Sphaerophthalma* (!) *albiplumosa* Schuster, 1944. Brooklyn Ent. Soc., Bul. 39: 145. ♀.

Biology: Rau, 1940. Ent. Soc. Amer., Ann. 33: 594 (host).

**auripilis fasciventris** Schuster. Tex. (Edinburg).

*Sphaerophthalma* (*Sphaerophthalma*) *auripilis fasciventris* Schuster, 1958. Ent. Amer. (n. s.) 37: 39. ♂.

Taxonomy: Mickel, 1974. Ent. Soc. Amer., Ann. 67: 466. ♀.

**boweri** Schuster. Tex. (College Station).

*Sphaerophthalma* (!) *boweri* Schuster, 1944. Brooklyn Ent. Soc., Bul. 39: 143. ♂.

**pensylvanica floridensis** Schuster. South. Fla.

*Sphaerophthalma* (!) *pennsylvanica* (!) *floridensis* Schuster, 1944. Brooklyn Ent. Soc., Bul. 39: 142. ♀.

Taxonomy: Mickel, 1974. Ent. Soc. Amer., Ann. 67: 466. ♂.

**pensylvanica pensylvanica** (Lepeletier). N. C., Ga., cent. Fla., La., Mo., Kans., Tex. Host:

*Sceliphron caementarium* (Drury), *Trypargilum politum* (Say), *T. clavatum* (Say); anthidiine sp.

*Mutilla pensylvanica* Lepeletier, 1845. Hist. Nat. Ins. Hym., v. 3, p. 628. ♂.

*Mutilla* (*Sphaerophthalma*) *pennsylvanica* (!) Blake, 1871. Amer. Ent. Soc., Trans. 3: 233. ♂.

*Mutilla* (*Sphaerophthalma*) *balteola* Blake, 1871. Amer. Ent. Soc., Trans. 3: 248. ♀.

Taxonomy: Bradley, 1916. Amer. Ent. Soc., Trans. 42: 331.

Biology: Rau, 1922. Acad. Sci. St. Louis, Trans. 24: 7 (host). —Rau, 1928. Acad. Sci. St. Louis, Trans. 25: 437 (host).

**pensylvanica scaeva** (Blake). Mass. to N. C., Ohio, Ill., Mo., Kans., Tex. Host: *Anoplopus a.*

*architectus* (Say), *A. m. mellipes* (Say); *Trypargilum clavatum* (Say), *T. collinum*

*rubrocinctum* (Pack.), *T. politum* (Say), *T. lactitarse* (Sauss.), *Sceliphron caementarium* (Dru.). Parasite: *Melittobia chalybii* Ashm.

*Mutilla* (*Sphaerophthalma*) *scaeva* Blake, 1871. Amer. Ent. Soc., Trans. 3: 232. ♂.

Taxonomy: Bradley, 1916. Amer. Ent. Soc., Trans. 42: 331.

Biology: Rau and Rau, 1918. Wasp studies afield, pp. 88-89 (host). —Rau, 1922. Acad. Sci. St. Louis, Trans. 24, no. 7: 8 (host). —Krombein, 1951. U. S. Dept. Agr., Monog. 2: 752 (hosts). —Krombein, 1967. Trap-nesting wasps and bees, pp. 476-478, figs. 135-139 (life history).

### Genus PHOTOMORPHUS Viereck

Taxonomy: Schuster, 1944. Brooklyn Ent. Soc., Bul. 39: 147-151 (east spp. only). —Krombein, 1954. Amer. Ent. Soc., Trans. 80: 6-7 (key to eastern females).

### Genus PHOTOMORPHUS Subgenus PHOTOMORPHINA Schuster

*Photomorphus* subg. *Photomorphina* Schuster, 1952. Brooklyn Ent. Soc., Bul. 47: 53.

Type-species: *Photomorphus* (*Photomorphina*) *aurifera* Schuster. Orig. desig.

*Photomorphus* subg. *Photomorphina* Schuster, 1958. Ent. Amer. (n.s.) 37: 8 (in key), 39.

Preocc. by *Photomorphus* subg. *Photomorphina* Schuster, 1952, and a syn. of it.

Type-species: *Photomorphus* (*Photomorphina*) *quadriangulata* Schuster. Orig. desig.

*aurifer* Schuster. Ariz.

*Photomorphus* (*Photomorphina*) *aurifera* Schuster, 1952. Brooklyn Ent. Soc., Bul. 47: 53. ♂.

*Photomorphus* (*Photomorphina*) *aurifera* Schuster, 1958. Ent. Amer. (n. s.) 37: 44. ♂.

Preocc. by and a syn. of *Photomorphus* (*Photomorphina*) *aurifera* Schuster, 1952.

*auriventris* Schuster. Tex.

*Photomorphus* (*Photomorphina*) *auriventris* Schuster, 1958. Ent. Amer. (n. s.) 37: 40. ♂.

*bequaertii* (Schuster), n. comb. (W. E. Ferguson). Tex.

*Odontophotopsis* (*Odontophotopsis*) *bequaertii* Schuster, 1958. Ent. Amer. (n. s.) 37: 52. ♂.

*californicus* Schuster. Calif.

*Photomorphus* (*Photomorphina*) *californica* Schuster, 1958. Ent. Amer. (n. s.) 37: 44. ♂.

*clandestinus* (Viereck). Tex., N. Mex.

*Odontophotopsis clandestinus* Viereck, 1903. Acad. Nat. Sci. Phila., Proc. 54: 740. ♂.

*cobabi* Schuster. Ariz.; Mexico (Sonora, Baja California).

*Photomorphus* (*Photomorphina*) *cobabi* Schuster, 1958. Ent. Amer. (n. s.) 37: 41. ♂.

*cochisae* Schuster. Ariz.; Mexico.

*Photomorphus* (*Photomorphina*) *cochisae* Schuster, 1958. Ent. Amer. (n. s.) 37: 43. ♂.

*coloradellus* Schuster. Colo.

*Photomorphus* (*Photomorphina*) *coloradella* Schuster, 1958. Ent. Amer. (n. s.) 37: 44. ♂.

*comobabi* Schuster. Ariz.; Mexico.

*Photomorphus* (*Photomorphina*) *comobabi* Schuster, 1958. Ent. Amer. (n. s.) 37: 45. ♂.

*crepusculus* (Viereck). Kans. (Morton Co.).

*Mutilla* (*Photomorphus*?) *crepuscula* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 188. ♂.

*dichrous* Schuster. Ariz.

*Photomorphus* (*Photomorphina*) *dichrous* Schuster, 1958. Ent. Amer. (n. s.) 37: 41. ♂.

*hebes* (Melandar). Tex., N. Mex., Ariz.; Mexico (Sonora, Coahuila, Tamaulipas).

*Mutilla hebes* Melander, 1903. Amer. Ent. Soc., Trans. 29: 311. ♂.

*Photomorphus* (*Photomorphina*) *taeniatus* Schuster, 1958. Ent. Amer. (n. s.) 37: 42. ♂.

*Photomorphus* (*Photomorphina*) *taeniatus parksi* Schuster, 1958. Ent. Amer. (n. s.) 37: 42. ♂.

*imperialoides* Schuster. Ariz.

*Photomorphus* (*Photomorphina*) *imperialoides* Schuster, 1958. Ent. Amer. (n. s.) 37: 40. ♂.

*jason* (Fox). Tex., Okla.

*Mutilla jason* Fox, 1899. Amer. Ent. Soc., Trans. 25: 250. ♂.

**juanita** Schuster. Tex.; Mexico (Tamaulipas).

*Photomorphus (Photomorphina) juanita* Schuster, 1952. Brooklyn Ent. Soc., Bul. 47: 57. ♂.

*Photomorphus (Photomorphina) juanita* Schuster, 1958. Ent. Amer. (n. s.) 37: 43. ♂.

Preocc. by and a syn. of *Photomorphus (Photomorphina) juanita* Schuster, 1952.

**minimus** Schuster. Ariz. (Wellton).

*Photomorphus (Photomorphina) minima* Schuster, 1958. Ent. Amer. (n. s.) 37: 43. ♀.

**myrmicoides** (Cockerell). Ala., Tex., Ill., Iowa, Kans., S. Dak.

*Mutilla parvula* Blake, 1886. Amer. Ent. Soc., Trans. 13: 206. ♀. Preocc.

*Sphaerophthalma* (!) *myrmicoides* Cockerell, 1895. Ent. News 6: 62. ♀.

*Mutilla impar* Melander, 1903. Amer. Ent. Soc., Trans. 29: 321. ♀.

*Odontophotopsis subtennis* Viereck, 1904. Amer. Ent. Soc., Trans. 30: 85. ♂.

Taxonomy: Bradley, 1916. Amer. Ent. Soc., Trans. 42: 336. ♂. —Mickel, 1934. Ent. Soc.

Amer., Ann. 27: 611. ♀, ♂. —Mickel, 1965. Ent. Soc. Wash., Proc. 67: 3-4 (synonymy).

**nanullus** Schuster. Ariz.

*Photomorphus (Photomorphina) nanulla* Schuster, 1958. Ent. Amer. (n. s.) 37: 44. ♂.

**obscurus** Schuster. Calif., Ariz.

*Photomorphus (Photomorphina) obscura* Schuster, 1958. Ent. Amer. (n. s.) 37: 45. ♂.

**quadrangulatus** Schuster. Ariz.; Mexico (Sonora).

*Photomorphus (Photomorphina) quadrangulata* Schuster, 1958. Ent. Amer. (n. s.) 37: 42.

♂.

**sarpedon** (Fox). Tex.; Mexico (Coahuila).

*Mutilla sarpedon* Fox, 1899. Amer. Ent. Soc., Trans. 25: 267. ♂.

**spinci** (Bradley). N. C. to Fla., Ala.

*Photopsis (Odontophotopsis) spinci* Bradley, 1916. Amer. Ent. Soc., Trans. 42: 335. ♂.

*Photopsis (Odontophotopsis) spinci floridensis* Schuster, 1944. Brooklyn Ent. Soc., Bul. 39: 155. ♂.

**spinciformis** Schuster. Tex.

*Photomorphus (Photomorphina) spinciformis* Schuster, 1958. Ent. Amer. (n. s.) 37: 44. ♂.

**thamyra** (Fox). Tex.

*Mutilla thamyra* Fox, 1899. Amer. Ent. Soc., Trans. 25: 267. ♂.

**trunculus** (Viereck). Kans., Okla., Tex., Ariz.

*Mutilla simpliciventris* Melander, 1903 (Oct.). Amer. Ent. Soc., Trans. 29: 315. ♂. Preocc. by Andre, July, 1903.

*Odontophotopsis trunculus* Viereck, 1904. Amer. Ent. Soc., Trans. 30: 85. ♂.

*Odontophotopsis melanderella* Krombein, 1951. U. S. Dept. Agr., Monog. 2: 757. N. name.

**wheeleri** (Melander). Tex. (Austin).

*Mutilla Wheeleri* Melander, 1903. Amer. Ent. Soc., Trans. 29: 316. ♂.

**vegas** Schuster. N. Mex., Ariz., Utah.

*Photomorphus (Photomorphina) vegas* Schuster, 1958. Ent. Amer. (n. s.) 37: 42. ♂.

### Genus PHOTOMORPHUS Subgenus PHOTOMORPHUS Viereck

*Photomorphus* Viereck, 1903. Ent. News 14: 249.

Type-species: *Photomorphus Johnsoni* Viereck. Orig. desig.

**alogus** Viereck. Ga., Fla., Miss.

*Photomorphus alogus* Viereck, 1903. Ent. News 14: 251. ♂.

Taxonomy: Krombein, 1954. Amer. Ent. Soc., Trans. 80: 3. ♀.

**banksi** (Bradley). N. J. south to Fla., Ala.

*Sphaerophthalma* (!) (*Photomorphus*) *banksi* Bradley, 1916. Amer. Ent. Soc., Trans. 42: 331. ♂.

**bradleyi** (Schuster). S. C. (Clemson).

*Photopsis bradleyi* Schuster, 1944. Brooklyn Ent. Soc., Bul. 39: 152. ♀.

**johnsoni johnsoni** Viereck. N. Y. to Ga., Okla.

*Photomorphus Johnsoni* Viereck, 1903. Ent. News 14: 249. ♂.

- Photomorphus johnsoni* var. *argentina* Schuster, 1944. Brooklyn Ent. Soc., Bul. 39: 148. ♂.
- johnsoni natchitoches** Schuster. La.  
*Photomorphus (Photomorphus) johnsoni natchitoches* Schuster, 1958. Ent. Amer. (n. s.) 37: 46. ♂.
- paulus** (Bradley). Ga., Fla.  
*Photopsis (Odontophotopsis) paula* Bradley, 1916. Amer. Ent. Soc., Trans. 42: 333. ♂.  
 Taxonomy: Schuster, 1944. Brooklyn Ent. Soc., Bul. 39: 154. ♂.
- quintilis** (Viereck). Iowa, Kans., La.  
*Mutilla (Photomorphus) quintilis* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 187. ♂.
- rubroscutellatus** (Bradley). Va. (Falls Church).  
*Sphaerophthalma* (!) (*Photomorphus*) *rubroscutellatus* Bradley, 1916. Amer. Ent. Soc., Trans. 42: 332. ♂.
- Genus ODONTOPHOTOPSIS Viereck**
- Revision: Viereck, 1904. Amer. Ent. Soc., Trans. 30: 81-92.
- Genus ODONTOPHOTOPSIS Subgenus ODONTOPHOTOPSIS Viereck**
- Odontophotopsis* Viereck, 1903. Acad. Nat. Sci. Phila., Proc. 54: 738.  
 Type-species: *Odontophotopsis exogyrus* Viereck. Orig. desig.
- Tetraphotopsis* Ashmead, 1903. Canad. Ent. 35: 305.  
 Type-species: *Tetraphotopsis Hubbardi* Ashmead. Orig. desig. (Not *Mutilla Hubbardi* Fox as cited by Mickel, 1928. U. S. Natl. Mus., Bul. 143: 37).
- acmaea** Viereck. Ariz., south. Calif.; Mexico (Sonora).  
*Odontophotopsis acmaeus* Viereck, 1904. Amer. Ent. Soc., Trans. 30: 84. ♂.
- adonis** (Fox). N. Mex. (Las Cruces).  
*Mutilla adonis* Fox, 1899. Amer. Ent. Soc., Trans. 25: 265. ♂.
- alemon** (Fox). Tex., N. Mex.  
*Mutilla alemon* Fox, 1899. Amer. Ent. Soc., Trans. 25: 266. ♂.  
*Mutilla trita* Melander, 1903. Amer. Ent. Soc., Trans. 29: 317. ♂.  
*Odontophotopsis crucis* Viereck, 1904. Amer. Ent. Soc., Trans. 30: 86. ♂.
- annulata** Baker. Calif. (Claremont).  
*Odontophotopsis annulatus* Baker, 1905. Invertebrata Pacifica 1: 94. ♂.
- anomala** Schuster. Tex.  
*Odontophotopsis (Odontophotopsis) anomala* Schuster, 1958. Ent. Amer. (n. s.) 37: 60. ♂.
- appacheorum appacheorum** Schuster. Tex.  
*Odontophotopsis (Odontophotopsis) appacheorum appacheorum* Schuster, 1958. Ent. Amer. (n. s.) 37: 55. ♂.
- appacheorum rostrata** Schuster. Ariz.  
*Odontophotopsis (Odontophotopsis) appacheorum rostratus* Schuster, 1958. Ent. Amer. (n. s.) 37: 55. ♂.
- argentina** (Provancher). Published type locality Fla. is erroneous.  
*Sphaerophthalma* (!) *argentina* Provancher, 1887. Addit. Corr. Faune Ent. Canada Hym., p. 251. ♂.
- armata** Schuster. Nev.  
*Odontophotopsis (Odontophotopsis) armata* Schuster, 1958. Ent. Amer. (n. s.) 37: 60. ♂.
- augusta** Viereck. N. Mex. (St. Augustine).  
*Odontophotopsis augustus* Viereck, 1904. Amer. Ent. Soc., Trans. 30: 90. ♂.
- bicolor** (Blake). Tex., Ariz.  
*Agama bicolor* Blake, 1879. Amer. Ent. Soc., Trans. 7: 252. ♂.  
*Mutilla Madejskii* Dalla Torre, 1897. Cat. Hym., v. 8, p. 56. N. name for *Agama bicolor* Blake, not *Mutilla bicolor* Pallas.
- Taxonomy: Fox, 1899. Amer. Ent. Soc., Trans. 25: 259-260. ♂ (in key to group *imperialis*).

- biramosa** Schuster. Calif. (Holtville).  
*Odontophotopsis (Odontophotopsis) biramosa* Schuster, 1952. Brooklyn Ent. Soc., Bul. 47: 43, fig. 1. ♂.
- braccata** Schuster. Tex., N. Mex.  
*Odontophotopsis (Odontophotopsis) braccatus* Schuster, 1958. Ent. Amer. (n. s.) 37: 54. ♂.
- clypeata** Schuster. Ariz., Nev., Calif.  
*Odontophotopsis (Odontophotopsis) clypeatus* Schuster, 1958. Ent. Amer. (n. s.) 37: 59. ♂.
- cockerelli** (Melander). Tex. (Cuero).  
*Mutilla Cockerelli* Melander, 1903. Amer. Ent. Soc., Trans. 29: 307. ♂.
- conifera** Schuster. Ariz.  
*Odontophotopsis (Odontophotopsis) coniferus* Schuster, 1958. Ent. Amer. (n. s.) 37: 48. ♂.
- cookii** Baker. Calif., Nev.  
*Odontophotopsis cookii* Baker, 1905. Invertebrata Pacifica 1: 93. ♂.
- delodonta** Viereck. Ariz.  
*Odontophotopsis delodontus* Viereck, 1904. Amer. Ent. Soc., Trans. 30: 91. ♂.
- edentata distans** Schuster. Tex. (Devils River).  
*Odontophotopsis (Odontophotopsis) edentata distans* Schuster, 1958. Ent. Amer. (n. s.) 37: 53. ♂.
- edentata edentata** Schuster. Ariz.  
*Odontophotopsis (Odontophotopsis) edentata edentata* Schuster, 1958. Ent. Amer. (n. s.) 37: 53. ♂.
- erebus** (Melander). Kans., Okla., Tex., N. Mex., Ariz., Utah; Mexico (Tamaulipas).  
*Mutilla Erebus* Melander, 1903. Amer. Ent. Soc., Trans. 29: 312. ♂.  
*Odontophotopsis avellanus* Viereck, 1904. Amer. Ent. Soc., Trans. 30: 88. ♂.
- eubule** (Cameron). N. Mex.; Mexico (Sonora). Host: Probably *Evaniella neomexicana* (Ashm.) in ootheca of *Arenivaga genitalis* Caud., or less likely, the ootheca itself.  
*Sphaerophthalma* (!) *eubule* Cameron, 1896. Biol. Cent.-Amer., Hym., v. 2, p. 383. ♂.  
*Mutilla hamata* Melander, 1903. Amer. Ent. Soc., Trans. 29: 314. ♂.
- Taxonomy: Mickel, 1965. Ent. Soc. Wash., Proc. 67: 1 (synonymy).  
 Biology: Mickel, 1974. Ent. Soc. Amer., Ann. 67: 468 (host).
- exogyra** Viereck. Calif. (La Jolla).  
*Odontophotopsis exogyrus* Viereck., 1903. Acad. Nat. Sci. Phila., Proc. 54: 738. ♂.
- fallax** Viereck. Nev.  
*Odontophotopsis fallax* Viereck, 1904. Amer. Ent. Soc., Trans. 30: 89. ♂.  
*Odontophotopsis ocellatus* Baker, 1905. Invertebrata Pacifica 1: 98. ♂.
- grandiceps** Schuster. Ariz. (Globe).  
*Odontophotopsis (Odontophotopsis) grandiceps* Schuster, 1958. Ent. Amer. (n. s.) 37: 53. ♂.
- grata** (Melander). N. Mex. (La Cueva).  
*Mutilla grata* Melander, 1903. Amer. Ent. Soc., Trans. 29: 308. ♂.
- hexadonta** Schuster. Calif.  
*Odontophotopsis (Odontophotopsis) hexadontus* Schuster, 1958. Ent. Amer. (n. s.) 37: 51. ♂.
- inconspicua brunnea** Schuster. Ariz.  
*Odontophotopsis (Odontophotopsis) inconspicua brunnea* Schuster, 1958. Ent. Amer. (n. s.) 37: 54. ♂.
- inconspicua inconspicua** (Blake). Calif., Nev.  
*Photopsis inconspicuus* Blake, 1886. Amer. Ent. Soc., Trans. 13: 272. ♂.  
*Mutilla infelix* Dalla Torre, 1897. Cat. Hym., v. 8, p. 50. N. name for *Photopsis inconspicuus* Blake, not *Mutilla inconspicua* Smith.
- lamellifera** Schuster. Ariz.  
*Odontophotopsis (Odontophotopsis) lamellifera* Schuster, 1958. Ent. Amer. (n. s.) 37: 56. ♂.
- melicausa melicausa** (Blake). B. C., Mont., Calif., Ariz., Tex.  
*Agama melicausa* Blake, 1871. Amer. Ent. Soc., Trans. 3: 261. ♂.  
*Mutilla brevicornis* Fox, 1899. Amer. Ent. Soc., Trans. 25: 255. ♂.  
*Odontophotopsis mellicornis* Baker, 1905. Invertebrata Pacifica 1: 96. ♂.

Taxonomy: Schuster, 1958. Ent. Amer. (n. s.) 37: 58 (synonymy).

**melicausa piceipes** Schuster. Mont.

*Odontophotopsis (Odontophotopsis) melicausa* (!) *piceipes* Schuster, 1958. Ent. Amer. (n. s.) 37: 58. ♂.

**melicausa westcottii** (Melander). Tex., N. Mex.

*Mutilla Westcottii* Melander, 1903. Amer. Ent. Soc., Trans. 29: 310. ♂.

*Odontophotopsis indotatus* Viereck, 1904. Amer. Ent. Soc., Trans. 30: 89. ♂.

**microdonta** Ferguson. Nev., Calif.

*Odontophotopsis (Odontophotopsis) microdonta* Ferguson, 1967. Brigham Young Univ. Sci., Bul., Ser. 8, no. 4: 22. ♂.

**obliqua** Viereck. B. C., Mont., Idaho, Wash., Nev., Calif.; Mexico (Baja California).

*Odontophotopsis obliquus* Viereck, 1925. Canad. Ent. 56: 112. ♂.

Taxonomy: Ferguson, 1967. Brigham Young Univ. Sci., Bul., Ser. 8, no. 4: 23 (redescription).

**parksiana** Schuster. Tex.

*Odontophotopsis (Odontophotopsis) parksiana* Schuster, 1958. Ent. Amer. (n. s.) 37: 57. ♂.

**parva** Schuster. Ariz. (Arlington).

*Odontophotopsis (Odontophotopsis) parva* Schuster, 1958. Ent. Amer. (n. s.) 37: 55. ♂.

**pudica** (Melander). Wash., Calif.

*Mutilla pudica* Melander, 1903. Amer. Ent. Soc., Trans. 29: 309. ♂.

*Odontophotopsis atripes* Mickel, 1938. Pan-Pacific Ent. 14: 182. ♂.

**quadridentata** Schuster. Calif.

*Odontophotopsis (Odontophotopsis) quadridentata* Schuster, 1958. Ent. Amer. (n. s.) 37: 51. ♂.

**quadrispinosa** Schuster. Nev., Calif.; Mexico (Baja California).

*Odontophotopsis (Odontophotopsis) quadrispinosa* Schuster, 1958. Ent. Amer. (n. s.) 37: 51. ♂.

Taxonomy: Ferguson, 1967. Brigham Young Univ. Sci., Bul., Ser. 8, no. 4: 24 (redescription).

**serca** Viereck. Nev., Calif.; Mexico (Baja California). Host: *Anthophora linsleyi* Timberlake.

*Odontophotopsis sercus* Viereck, 1904. Amer. Ent. Soc., Trans. 30: 87. ♂.

Biology: Linsley and MacSwain, 1942. Amer. Midland Nat. 27: 409 (host).

**setifera** Schuster. South. Calif., Nev., Ariz.

*Odontophotopsis (Odontophotopsis) setifera* Schuster, 1952. Brooklyn Ent. Soc., Bul. 47: 47. ♂.

**succinea** Viereck. Calif.

*Odontophotopsis succineus* Viereck, 1903. Acad. Nat. Sci. Phila., Proc. 54: 741. ♂.

**tapajos aulus** (Blake). Tex.

*Agama Aulus* Blake, 1872. Amer. Ent. Soc., Trans. 4: 75. ♂.

**tapajos tapajos** (Blake). Tex., Ariz.

*Agama Tapajos* Blake, 1871. Amer. Ent. Soc., Trans. 3: 262. ♂.

*Agama Astyanax* Blake, 1879. Amer. Ent. Soc., Trans. 7: 254. ♂.

**tenuiptera** Schuster. Ariz.; Mexico.

*Odontophotopsis (Odontophotopsis) tenuiptera* Schuster, 1958. Ent. Amer. (n. s.) 37: 47. ♂.

**territa obscura** Schuster. Ariz.

*Odontophotopsis (Odontophotopsis) territa obscura* Schuster, 1958. Ent. Amer. (n. s.) 37: 59. ♂.

**territa territa** (Cockerell). N. Mex. (Las Cruces).

*Photopsis territus* Cockerell, 1894. Ent. News 5: 200. ♂.

**unicornis** Schuster. Ariz., Calif.

*Odontophotopsis (Odontophotopsis) unicornis* Schuster, 1958. Ent. Amer. (n. s.) 37: 52. ♂.

**venusta** (Blake). Ariz.

*Photopsis venustus* Blake, 1886. Amer. Ent. Soc., Trans. 13: 270. ♂.

*Mutilla pretiosissima* Dalla Torre, 1897. Cat. Hym., v. 8, p. 74. N. name for *Photopsis venustus* Blake, not *Mutilla venusta* Smith.

*Tetraphotopsis Hubbardi* Ashmead, 1903. Canad. Ent. 35: 305. ♂.



Taxonomy: Schuster, 1958. Ent. Amer. (n. s.) 37: 54 (synonymy).

**viereckii** Baker. Nev. (Ormsby Co.).

*Odontophotopsis viereckii* Baker, 1905. Invertebrata Pacifica 1: 97. ♂.

#### Genus ODONTOPHOTOPSIS Subgenus PERIPHOTOPSIS Schuster

*Odontophotopsis* subg. *Periphotopsis* Schuster, 1958. Ent. Amer. (n. s.) 37: 8 (in key), 60.

Type-species: *Odontophotopsis (Periphotopsis) mamatus* Schuster. Orig. desig.

**mamata** Schuster. Ariz., Nev., Calif.

*Odontophotopsis (Periphotopsis) mamatus* Schuster, 1958. Ent. Amer. (n. s.) 37: 60. ♂.

#### Genus PROTOPHOTOPSIS Schuster

##### Genus PROTOPHOTOPSIS Subgenus PROTOPHOTOPSIS Schuster

*Protophotopsis* Schuster, 1947. Ent. Soc. Amer., Ann. 39: 693.

Type-species: *Protophotopsis scudderi* Schuster. Orig. desig.

Only the typical subgenus occurs in North America.

Taxonomy: Schuster, 1949. Ent. Amer. (n. s.) 29: 82-85.

**scudderi** Schuster. Kans., Tex., Colo.

*Protophotopsis scudderi* Schuster, 1947. Ent. Soc. Amer., Ann. 39: 694. ♂.

**venenaria** (Melandar). Kans., Tex., Calif. Possibly the opposite sex of *scudderi* Schuster.

*Mutilla venenaria* Melander, 1903. Amer. Ent. Soc., Trans. 29: 320. ♀.

Taxonomy: Schuster, 1949. Ent. Amer. (n. s.) 29: 83.

#### TRIBE PSEUDOMETHOCINI

All species are diurnal. The authenticated host records suggest that members of this tribe are parasitic on various kinds of ground-nesting bees, principally halictids belonging to the subfamilies Halictinae and Nomiinae. Fattig, 1943 (Emory Univ. Mus. Bul. 1: 4) records *frigida* (Smith) as having been reared from mud cells of the eumenid wasp *Ancistrocerus luteonidus* Boh.; this may be based on a misidentification.

Revision: Mickel, 1924. U. S. Natl. Mus., Proc. 64(15): 1-51, pls. 1-4. — Mickel, 1935. Amer.

Ent. Soc., Trans. 61: 383-398.

#### Genus PSEUDOMETHOCA Ashmead

*Pseudomethoca* Ashmead, 1896. Amer. Ent. Soc., Trans. 23: 181.

Type-species: *Photopsis Cressoni* Fox. Orig. desig. (= *Pseudomethoca frigida* (Smith)).

*Nomiaephagus* Ashmead, 1899. N. Y. Ent. Soc., Jour. 7: 56.

Type-species: *Mutilla (Sphaerophthalma) Sanbornii* Blake. Orig. desig.

**albicomma** Mickel. Tex. (Rio Grande in Brewster Co.).

*Pseudomethoca albicomma* Mickel, 1924. U. S. Natl. Mus., Proc. 64 (15): 29. ♀.

**anthracina** (Fox). Oreg., Calif.

*Sphaerophthalma* (!) *anthracina* Fox, 1892. Ent. News 3: 172. ♂.

*Mutilla anthracicolor* Dalla Torre, 1897. Cat. Hym., v. 8, p. 9. N. name for

*Sphaerophthalma* (!) *anthracina* Fox, not *Mutilla anthracina* Gerstaecker.

*Mutilla harpalyce* Fox, 1899. Amer. Ent. Soc., Trans. 25: 227. ♀.

Taxonomy: Hurd, 1951. Pan-Pacific Ent. 27: 156 (synonymy).

**athamas** (Fox). Oreg., Calif.

*Mutilla athamas* Fox, 1899. Amer. Ent. Soc., Trans. 25: 225. ♂.

**aureovestita** Bradley. N. Mex., Ariz.

*Pseudomethoca aureovestita* Bradley, 1924. In Mickel, U. S. Natl. Mus., Proc. 64 (15): 22. ♀, ♂.

**bequaerti** Mickel. Tex., N. Mex., Ariz., Colo., Mont.

*Pseudomethoca bequaerti* Mickel, 1924. U. S. Natl. Mus., Proc. 64 (15): 13. ♀.

**brazoria** (Blake). Okla., Tex.

*Mutilla (Sphaerophthalma) brazoria* Blake, 1871. Amer. Ent. Soc., Trans. 3: 255. ♀.

**carbonaria** Mickel. Tex.

*Pseudomethoca carbonaria* Mickel, 1924. U. S. Natl. Mus., Proc. 64 (15): 43. ♂.

**cephalargia** Mickel. Ariz. (Santa Catalina Mts.).

*Pseudomethoca cephalargia* Mickel, 1924. U. S. Natl. Mus., Proc. 64 (15): 17. ♀.

**connectens** (Cresson). Calif.

*Mutilla connectens* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 387. ♀.

**contumax** (Cresson). Iowa, S. Dak., Nebr., Kans., Tex., Colo., Ariz.; Mexico.

*Mutilla contumax* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 437. ♀.

*Mutilla micropthalma* Gerstaecker, 1874. Arch. Naturgesch. 40: 64. ♂.

**contumeliosa** Mickel. Utah, Idaho, Calif.

*Pseudomethoca contumeliosa* Mickel, 1935. Amer. Ent. Soc., Trans. 61: 393. ♀.

**damia** (Cameron). Ariz.; Mexico (Guerrero).

*Sphaerophthalma (!) damia* Cameron, 1894. Biol. Cent.-Amer., Hym., v. 2, p. 383. ♂.

*Mutilla sphaerophthalmica* Dalla Torre, 1897. Cat. Hym., v. 8, p. 87. N. name.

**dentifrontalis** Bradley. Oreg., Calif.

*Pseudomethoca dentifrontalis* Bradley, 1924. In Mickel, U. S. Natl. Mus., Proc. 64 (15): 11. ♀.

**dentigula** Mickel. Tex. (Trans-Pecos).

*Pseudomethoca dentigula* Mickel, 1935. Amer. Ent. Soc., Trans. 61: 391. ♀.

**donaeanae** (Cockerell). Tex., N. Mex., Ariz., Calif.

*Sphaerophthalma (!) donaeanae* Cockerell, 1897. In Cockerell and Fox, Acad. Nat. Sci. Phila., Proc. 49: 127. ♀.

**flammigera** Mickel. Ariz.

*Pseudomethoca flammigera* Mickel, 1924. U. S. Natl. Mus., Proc. 64 (15): 21. ♀.

**flavida** (Blake). Tex.

*Mutilla (Sphaerophthalma) flavida* Blake, 1871. Amer. Ent. Soc., Trans. 3: 249. ♂.

**frigida** (Smith). Southern Canada and U. S. east of Rocky Mts. Host: *Dialictus zephyrus* (Sm.),

*D. coerules* (Robt.), *D. rohweri* (Ellis)?, *D. laevissimus* (Sm.)?, *D. versatus* (Robt.), *D. imitatus* (Sm.)?, *Erylaeus cinctipes* (Prov.), *Augochlorella striata* (Prov.)?

*Mutilla frigida* Smith, 1855. Cat. Hym. Brit. Mus., v. 3, p. 60. ♀.

*Mutilla (Sphaerophthalma) canadensis* Blake, 1871. Amer. Ent. Soc., Trans. 3: 252. ♀.

*Photopsis Cressoni* Fox, 1890. Ent. News 1: 138. ♂.

*Sphaerophthalma (!) alveolata* Provancher, 1895. Nat. Canad. 22: 110. ♀.

*Mutilla neojerseensis* Dalla Torre, 1897. Cat. Hym., v. 8, p. 65. N. name for *Photopsis (!) Cressoni* Fox, not *Mutilla Cressoni* Blake.

Taxonomy: Brothers, 1972. Kans. Univ. Sci. Bul. 50: 25-31, figs. 11-40 (egg, larvae, pupae).

Biology: Melander and Brues, 1903. Biol. Bul. 5: 4-7, fig. 4 (behavior in host nest).

—Krombein, 1938. Brooklyn Ent. Soc., Bul. 33:14-15 (behavior in host nest). —Fattig, 1943.

Emory Univ. Mus. Bul. 1: 4 (questionable host record). —Shappirio, 1947. Brooklyn Ent.

Soc., Bul. 42: 163 (mating behavior). —Michener and Wille, 1961. Kans. Univ. Sci. Bul. 42:

1129-1130 (behavior in host nests). —Lin, 1964. Ins. Sociaux 11: 187-192 (behavior in host

nests). —Batra, 1965. Kans. Ent. Soc., Jour. 38: 383-386, figs. 6 a-c, 7 a-b (life history,

behavior). —Michener, 1966. Kans. Ent. Soc., Jour. 39: 196-197 (host record). —Knerer and

Atwood, 1967. Ent. Soc. Ontario, Proc. 97: 106 (host record). —Brothers, 1972. Kans. Univ.

Sci. Bul. 50: 1-25, figs. 1-10 (life history, behavior).

**gila** (Blake). Tex. (Brownsville).

*Mutilla (Sphaerophthalma) gila* Blake, 1871. Amer. Ent. Soc., Trans. 3: 250. ♂.

**ilione** (Fox). Tex., Okla.

*Mutilla ilione* Fox, 1899. Amer. Ent. Soc., Trans. 25: 268. ♀.

*Mutilla aprica* Melander, 1903. Amer. Ent. Soc., Trans. 29: 322. ♀.

Taxonomy: Mickel, 1965. Ent. Soc. Wash., Proc. 67: 2 (synonymy).

**klotsi** Mickel. Colo. (Hugo).

*Pseudomethoca klotsi* Mickel, 1935. Amer. Ent. Soc., Trans. 61: 389. ♀.

*manca* Mickel. Utah.

*Pseudomethoca manca* Mickel, 1924. U. S. Natl. Mus., Proc. 64 (15): 45. ♂.

*meritoria* Mickel. Tex.

*Pseudomethoca meritoria* Mickel, 1924. U. S. Natl. Mus., Proc. 64 (15): 27. ♀.

*mulaiki* Mickel. Tex. (Cameron Co.).

*Pseudomethoca mulaiki* Mickel, 1938. Ent. Soc. Amer., Ann. 31: 150. ♀.

*nephele* (Fox). Tex.

*Mutilla nephele* Fox, 1899. Amer. Ent. Soc., Trans. 25: 223. ♀.

*nigricula* Mickel. Ariz.

*Pseudomethoca nigricula* Mickel, 1924. U. S. Natl. Mus., Proc. 64 (15): 26. ♂.

*nudula* Mickel. N. Mex. (Pecos). Host: Possibly *Calliopsis* sp.

*Pseudomethoca nudula* Mickel, 1924. U. S. Natl. Mus., Proc. 64 (15): 15. ♀.

*oceola* (Blake). N. J. south to Fla., west to S. Dak. and Ariz.

*Mutilla (Sphaerophthalma) Oceola* Blake, 1871. Amer. Ent. Soc., Trans. 3: 248. ♂.

*Mutilla hippodamia* Fox, 1899. Amer. Ent. Soc., Trans. 25: 227. ♀.

*oculata* (Banks). N. C., Ga., Fla.

*Nomiaephagus oculatus* Banks, 1921. Ent. Soc. Amer., Ann. 14: 24. ♀.

*oculissima* Mickel. N. Mex. (Pecos).

*Pseudomethoca oculissima* Mickel, 1924. U. S. Natl. Mus., Proc. 64 (15): 14. ♀.

*paludata* Mickel. Nebr., Kans., Wyo., Colo., N. Mex., Ariz.

*Pseudomethoca paludata* Mickel, 1924. U. S. Natl. Mus., Proc. 64 (15): 29. ♀.

*Pseudomethoca scriptulosa* Mickel, 1924. U. S. Natl. Mus., Proc. 64 (15): 31. ♂.

*pigmentata* Mickel. Tex.

*Pseudomethoca pigmentata* Mickel, 1924. U. S. Natl. Mus., Proc. 64 (15): 24. ♀.

*praeclara* (Blake). Ariz., Calif.

*Sphaerophthalma* (?) *praeclara* Blake, 1886. Amer. Ent. Soc., Trans. 13: 252. ♀.

*Mutilla aegaeon* Fox, 1899. Amer. Ent. Soc., Trans. 25: 229. ♂.

*Nomiaephagus acuum* Cockerell, 1915. Entomologist 48: 250. ♀.

*Pseudomethoca (Nomiaephagus) aegaeon* (!) Bradley, 1916. Amer. Ent. Soc., Trans. 42: 321. ♂.

*propinqua* (Cresson). Minn. south to Tex., west to Alta. and Ariz. Host: *Nomia m. melanderi* Ckll.

*Mutilla propinqua* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 433. ♂.

*Mutilla montivaga* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 436. ♀.

*Pseudomethoca sacatona* Caldwell, 1939. Pan-Pacific Ent. 15: 94. ♀.

Biology: Krombein, 1958. U. S. Dept. Agr., Monog. 2, Sup. 1: 103 (host record).

*quadrinotata* Mickel. Ariz. (Tucson).

*Pseudomethoca quadrinotata* Mickel, 1938. Ent. Soc. Amer., Ann. 31: 149. ♀.

*russeola* Mickel. Tex. (San Diego).

*Pseudomethoca russeola* Mickel, 1924. U. S. Natl. Mus., Proc. 64 (15): 44. ♂.

*sanbornii aetis* (Fox). ?Conn., N. C. south to Fla., west to Tex. in L. Austr. Zone.

*Mutilla aetis* Fox, 1899. Amer. Ent. Soc., Trans. 25: 228. ♀.

*Pseudomethoca (Nomiaephagus) aetis* (!) Bradley, 1916. Amer. Ent. Soc., Trans. 42: 312, 316. ♀.

Taxonomy: Krombein, 1953. Wasmann Jour. Biol. 10: 308 (reduced to subsp. rank).

*sanbornii sanbornii* (Blake). Mass. south to Fla., west to Nebr. and Tex. in Transition and U. Austr. Zones. Host: *Nomia pattoni* Cockerell.

*Mutilla (Sphaerophthalma) Sanbornii* Blake, 1871. Amer. Ent. Soc., Trans. 3: 248. ♂.

Biology: Mickel, 1924. U. S. Natl. Mus., Proc. 64 (15): 38 (host).

*scaevolella* (Cockerell and Casad). Tex., N. Mex.

*Sphaerophthalma* (?) *scaevolella* Cockerell and Casad, 1895. Amer. Ent. Soc., Trans. 22: 298. ♀.

*simillima* (Smith). Mass. south to Fla., west to Nebr. and Tex.

*Mutilla simillima* Smith, 1855. Cat. Hym. Brit. Mus., v. 3, p. 62. ♀.

*Mutilla geryon* Fox, 1899. Amer. Ent. Soc., Trans. 25: 255. ♂.

*Mutilla Henshawii* Melander, 1903. Amer. Ent. Soc., Trans. 29: 303. ♂.

*Mutilla daeckei* Rohwer, 1910. Ent. Soc. Wash., Proc. 12: 49. ♂.

*Pseudomethoca simillina* Mickel, 1924. U. S. Natl. Mus., Proc. 64 (15): 32. ♀ (♂ misdet.).

Taxonomy: Krombein, 1948. Ent. News 59: 187-189.

Biology: Shappirio, 1947. Brooklyn Ent. Soc., Bul. 42: 163 (mating behavior).

**torrida** Krombein. Fla.

*Pseudomethoca frigida torrida* Krombein, 1954. Amer. Ent. Soc., Trans. 80: 7, fig. 7. ♀, ♂.

**toumeyi** (Fox). Tex., Ariz.; Mexico (Sonora).

*Sphaerophthalma* (!) *toumeyi* Fox, 1894. Ent. News 5: 297. ♀.

Taxonomy: Mickel, 1974. Ent. Soc. Amer., Ann. 67: 468. ♂.

**vanduzeei** Bradley. Va., S. C., Ga., Fla., Tex. Host: *Nomia maneci* Ckll.

*Pseudomethoca (Nomiaephagus) vanduzeei* Bradley, 1916. Amer. Ent. Soc., Trans. 42: 321. ♂.

*Pseudomethoca fattigi* Mickel, 1938. Ent. Soc. Amer., Ann. 31: 147. ♀.

*Pseudomethoca vanduzeei* (!) Krombein, 1951. U. S. Dept. Agr., Monog. 2: 761. Emend.

Biology: Fattig, 1943. Emory Univ. Mus. Bul. 1: 6 (host record).

**wickhami** (Cockerell and Casad). Tex. (Fedor).

*Sphaerophthalma* (!) *wickhami* Cockerell and Casad, 1895. Amer. Ent. Soc., Trans. 22: 297. ♀.

### Genus MYRMILLOIDES Andre

*Myrmilloides* Andre, 1903. In Wytsman, Gen. Ins., fasc. 11, p. 26.

Type-species: *Mutilla (Sphaerophthalma) grandiceps* Blake. Orig. desig.

**grandiceps** (Blake). Iowa, Nebr., Colo., Kans., Mo., Okla., Ark., Tex., La., Tenn. Host: *Dialictus zephyrus* (Sm.)?, *Augochlorella striata* (Prov.)?, *A. persimilis* (Vier.)?

*Mutilla (Sphaerophthalma) grandiceps* Blake, 1872. Amer. Ent. Soc., Trans. 4: 74. ♀, ♂.

Biology: Melander, 1903. Amer. Ent. Soc., Trans. 29: 293 (host record). —Ordway, 1964. Kans. Ent. Soc., Jour. 37: 149 (host records).

### TRIBE DASYMUTILLINI

Members of this tribe are diurnal except for a few species of *Dasymutilla*.

### Genus DASYMUTILLA Ashmead

*Dasymutilla* Ashmead, 1899. N. Y. Ent. Soc., Jour. 7: 57.

Type-species: *Mutilla (Sphaerophthalma) Gorgoa* Blake. Orig. desig.

*Bruesia* Ashmead, 1903. Canad. Ent. 35: 306.

Type-species: *Mutilla harmonia* Fox. Orig. desig.

*Pycnomutilla* Ashmead, 1904. Canad. Ent. 36: 8.

Type-species: *Mutilla (Sphaerophthalma) Waco* Blake. Orig. desig.

Revision: Mickel, 1928. U. S. Natl. Mus., Bul. 143: 1-351, 5 pls., 28 text figs. —Mickel, 1936. Ent. Soc. Amer., Ann. 29: 29-60, 3 figs. (revised key to spp.).

Taxonomy: Hurd, 1951. Calif. Ins. Survey Bul. 1: 89-118, 1 pl. (Calif. spp.)

Morphology: Snodgrass, 1941. Smithsn. Inst., Misc. Collect. 99, no. 14, p. 43, pl. 14 A-F (male genitalia).

**albiceris** Mickel. Calif. (San Bernardino Co.); Mexico (Baja California).

*Dasymutilla albiceris* Mickel, 1936. Pan-Pacific Ent. 12: 91. ♀.

**alesia** Banks. Mass. south to Fla., west to Ill. and Okla.

*Dasymutilla alesia* Banks, 1921. Ent. Soc. Amer., Ann. 14: 24. ♀.

**angulata** Krombein. Mich., Ill., Iowa, Mo., S. Dak., Nebr., Kans.

*Mutilla anguliceps* Fox, 1899. Amer. Ent. Soc., Trans. 25: 240. ♀. Preocc. by Andre, 1897.

*Dasymutilla angulata* Krombein, 1951. U. S. Dept. Agr., Monog. 2: 762. N. name.

**apicalata** (Blake). Tex., Ariz.; Mexico (Guerrero).

*Mutilla* (*Sphaerophthalma*) *apicalata* Blake, 1871. Amer. Ent. Soc., Trans. 3: 238. ♂.

*Sphaerophthalma* (!) *perfidiosa* Cameron, 1895. Biol. Cent.-Amer., Hym., v. 2, p. 368. ♂.

Preocc. in *Mutilla*.

*Sphaerophthalma* (!) *guerreroensis* Cameron, 1895. Biol. Cent.-Amer., Hym., v. 2, p. 369. ♂.

*Mutilla perfida* Dalla Torre, 1897. Cat. Hym., v. 8, p. 72. N. name.

Taxonomy: Mickel, 1965. Ent. Soc. Wash., Proc. 67: 2 (synonymy).

**arcania** Mickel. Nebr., Okla., Tex., N. Mex., Colo.

*Dasymutilla arcana* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 217. ♂.

**arenivaga** Mickel. Ariz., Calif. *D. megalophthalma* Mick. may be the male.

*Dasymutilla arenivaga* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 278. ♀.

**arenivaga** var. **unicolor** Mickel. Ariz. (Ft. Mojave).

*Dasymutilla arenivaga* var. *unicolor* Mickel, 1936. Ent. Soc. Amer., Ann. 29: 59. ♀.

**asopus asopus** (Cresson). Man., Minn., N. Dak., Mont., S. Dak., Nebr., Kans., Colo., Tex. Host:

*Dianthidium* sp.?

*Mutilla Asopus* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 435. ♂.

*Ephuta sparsiformis* Cockerell and Rohwer, 1908. Psyche 15: 4. ♀.

Biology: Hicks, 1926. Colo. Univ., Studies, p. 249. — Mickel, 1928. U. S. Natl. Mus., Bul. 143: 61.

**asopus bexar** (Blake). Mass. south to Fla., Miss., Tex., Mo., Ind. Host: *Anthophora abrupta*

Say, *A. ursina* Cr.; *Dianthidium curvatum sayi* Ckll., *Paranthidium j. jugatorium* Say.

*Mutilla* (*Sphaerophthalma*) *Bexar* Blake, 1871. Amer. Ent. Soc., Trans. 3: 238. ♂.

*Mutilla harmonia* Fox, 1899. Amer. Ent. Soc., Trans. 25: 229. ♀.

Biology: Fattig, 1943. Emory Univ. Mus. Bul. 1: 4-5 (host records). — Krombein, 1958. U. S.

Dept. Agr., Monog. 2, Sup. 1: 103 (host record). — Michener, 1975. Kans. Ent. Soc., Jour. 48: 199 (host).

**asopus cassandra** Mickel. Fla.

*Dasymutilla cassandra* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 64. ♂.

**asteria** Mickel. Ariz. (Pima Co.). Host: *Microbembex nigrifrons* (Prov.).

*Dasymutilla asteria* Mickel, 1936. Ent. Soc. Amer., Ann. 29: 57. ♀.

Biology: Haddock, 1967. In Krombein, U. S. Dept. Agr., Monog. 2, Sup. 2: 339 (host record).

**atricauda** Mickel. Calif., Ariz.

*Dasymutilla atricauda* Mickel, 1936. Pan-Pacific Ent. 12: 92. ♀.

**atrifimbriata** Mickel. Kans., Ark., Okla., Tex., Ariz.

*Dasymutilla atrifimbriata* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 169. ♀.

**atrifulva** Mickel. Ariz.

*Dasymutilla atrifulva* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 290. ♂.

**aureola** (Cresson). Nev., Oreg., Calif. Host: *Anthophora stanfordiana* Ckll., *Melissodes* sp.

*Mutilla aureola* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 386. ♀.

*Sphaerophthalma* (!) *parmosa* Blake, 1886. Amer. Ent. Soc., Trans. 13: 210. ♀.

*Sphaerophthalma* (!) *mollissima* Blake, 1886. Amer. Ent. Soc., Trans. 13: 215. ♂.

Biology: Krombein, 1958. U. S. Dept. Agr., Monog. 2, Sup. 1: 103 (host records).

**aureola** var. **pacifica** (Cresson). B. C., Calif.

*Mutilla pacifica* Cresson, 1875. Amer. Ent. Soc., Trans. 5: 120. ♀.

**biguttata** (Cockerell). Miss., La., Tex., Ark., Kans., Ariz.

*Sphaerophthalma* (!) *quadriguttata* var. *biguttata* Cockerell, 1895. Ent. News 6: 63. ♀.

**bioculata** (Cresson). Man. south to La., west to B. C. and N. Mex. Host: *Bembix pruinosa* Fox,

*B. americana spinolae* Lep.?, *Microbembex monodonta* (Say).

*Mutilla bioculata* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 431. ♂.

*Mutilla Aegina* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 435. ♀.

*Mutilla chlamydata* Melander, 1903. Amer. Ent. Soc., Trans. 29: 299. ♀.

- Biology: Mickel, 1924. Ent. News 35: 236-242. — Krombein, 1958. U. S. Dept. Agr., Monog. 2, Sup. 1: 103 (host record). — Cottrell, 1972. *In* Brothers, Kans. Univ. Sci. Bul. 50: 31-36, figs. 41-42 (life history).
- birkmani** (Melander). Nebr., Wyo., Kans., Okla., Tex.  
*Mutilla Birkmani* Melander, 1903. Amer. Ent. Soc., Trans. 29: 313. ♀.
- bollii** (Fox). Miss., La., Tex., Okla., Kans.  
*Mutilla Bollii* Fox, 1899. Amer. Ent. Soc., Trans. 25: 242. ♀.  
*Dasymutilla blawana* Rohwer, 1912. U. S. Natl. Mus., Proc. 41: 461. ♀.
- bonita** Mickel. Ariz.  
*Dasymutilla bonita* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 208. ♀.  
*Dasymutilla poliothrix* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 285. ♂.
- californica** (Radoszkowski). B. C., Oreg., Utah, Calif.  
*Mutilla Californica* Radoszkowski, 1861. Soc. Ent. Rossica, Horae 1: 86. ♀.  
*Dasymutilla abdita* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 293.
- californica** var. **clio** (Blake). B. C., Idaho, Nev., Calif.  
*Mutilla Clio* Blake, 1879. Amer. Ent. Soc., Trans. 7: 251. ♀.
- calorata** Mickel. Kans., Okla., Tex., N. Mex., Colo.  
*Dasymutilla calorata* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 227. ♀.
- campanula** Mickel. Kans., Colo.  
*Dasymutilla campanula* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 178. ♀.
- candida** Mickel. Ariz. (Douglas).  
*Dasymutilla candida* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 296. ♂.
- canella** (Blake). Mass. to Pa., west to Man. and Tex. Host: *Dialictus pruinus* (Robt.)?  
*Mutilla (Sphaerophthalma) canella* Blake, 1871. Amer. Ent. Soc., Trans. 3: 239. ♂.  
*Mutilla rugulosa* Fox, 1899. Amer. Ent. Soc., Trans. 25: 240. ♀.  
*Mutilla infensa* Melander and Brues, 1903. Biol. Bul. 5: 24. ♀.
- Biology: Viereck, 1902. Ent. News 13: 72. — Melander and Brues, 1903. Biol. Bul. 5: 25 (putative host).
- caneo** (Blake). Minn., N. Dak., south to Tex. and N. Mex., west to Alta. and B. C.  
*Mutilla caneo* Blake, 1879. Amer. Ent. Soc., Trans. 7: 250. ♀.  
*Mutilla mixtura* Blake, 1879. Amer. Ent. Soc., Trans. 7: 251. ♀.  
*Mutilla myrrha* Fox, 1899. Amer. Ent. Soc., Trans. 25: 258. ♀.
- castor** (Blake). S. C., Ga., Fla., Ala., Miss., La., Tex. Host: *Polistes fuscatus* (F.).  
*Mutilla (Sphaerophthalma) castor* Blake, 1871. Amer. Ent. Soc., Trans. 3: 237. ♂.  
*Dasymutilla mediator* Mickel, 1938. Ent. Soc. Amer., Ann. 31: 152. ♀.
- Biology: Fattig, 1943. Emory Univ. Mus. Bul. 1: 6 (host record).
- chattahoochei** Bradley. N. C. south to Fla.  
*Dasymutilla (Dasymutilla) chattahoochei* Bradley, 1916. Amer. Ent. Soc., Trans. 42: 324. ♀.  
*Dasymutilla (Dasymutilla) areneronea* Bradley, 1916. Amer. Ent. Soc., Trans. 42: 324. ♀.
- Taxonomy: Krombein, 1954. Amer. Ent. Soc., Trans. 80: 9, fig. 5 (description male).
- chiron** (Blake). Tex.  
*Mutilla (Sphaerophthalma) Chiron* Blake, 1872. Amer. Ent. Soc., Trans. 4: 72. ♂.  
*Mutilla Ursula* var. *texana* Cresson, 1875. Amer. Ent. Soc., Trans. 5: 120. ♂.
- chiron** var. **ursula** (Cresson). B. C. south to Ariz. and Calif. and southeast to Tex.  
*Mutilla Ursula* Cresson, 1875. Amer. Ent. Soc., Trans. 5: 120. ♂.
- chisos** Mickel. Tex.  
*Dasymutilla chisos* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 284. ♂.
- clotho** (Blake). Okla., Tex.  
*Mutilla (Sphaerophthalma) Clotho* Blake, 1872. Amer. Ent. Soc., Trans. 4: 72. ♀.
- clytemnestra** (Fox). Oreg., Calif.  
*Mutilla clytemnestra* Fox, 1899. Amer. Ent. Soc., Trans. 25: 246. ♀.
- coccineohirta** (Blake). Idaho, Nev., Calif., Oreg., Wash.  
*Mutilla (Sphaerophthalma) coccineohirta* Blake, 1871. Amer. Ent. Soc., Trans. 3: 235. ♂.

- Mutilla ochracea* Blake, 1879. Amer. Ent. Soc., Trans. 7: 247. ♂.  
*Sphaerophthalma* (!) *venifica* Blake, 1886. Amer. Ent. Soc., Trans. 13: 210. ♀.  
*Mutilla progne* Fox, 1899. Amer. Ent. Soc., Trans. 25: 247. ♀.  
*Dasytmilla aetina* Cockerell, 1915. Entomologist 48: 249. ♂.
- columbiana** Mickel. B. C. (Nicola).  
*Dasytmilla columbiana* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 119. ♂.
- connectens** (Cameron). Ariz.; Mexico (Chihuahua, Jalisco, Baja California).  
*Sphaerophthalma* (!) *connectens* Cameron, 1895. Biol. Cent.-Amer., Hym., v. 2, p. 362. ♀.  
 Secondary homonym in *Mutilla*.  
*Mutilla eggeri* Dalla Torre, 1897. Cat. Hym., v. 8, p. 33. N. name.  
*Dasytmilla helva* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 259. ♀.
- Taxonomy: Mickel, 1965. Ent. Soc. Wash., Proc. 67: 2 (synonymy).
- corecra** Mickel. Tex.  
*Dasytmilla corecra* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 180. ♀.
- cotulla** Mickel. Tex.  
*Dasytmilla cotulla* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 75. ♂.
- creon** (Blake). Tex., Ark.  
*Mutilla* (*Sphaerophthalma*) *Creon* Blake, 1872. Amer. Ent. Soc., Trans. 4: 73. ♂.
- creusa** (Cresson). Ark., Tex., Okla., Kans., Nebr., Colo., N. Mex.  
*Mutilla Creusa* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 431. ♀.
- creusa** var. **bellona** (Cresson). Ark., Kans., Nebr., Wyo., Colo. Host: *Bembix amoena* Handl.  
 Possibly a synonym of *bioculata* (Cr.).  
*Mutilla Bellona* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 434. ♀.
- Biology: Evans, 1966. Compar. ethology and evolution of sand wasps, p. 288 (host record).
- curialis** Mickel. N. Mex. (Jemez Springs).  
*Dasytmilla curialis* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 274. ♂.
- curticeps** Mickel. Kans., Tex.  
*Dasytmilla curticeps* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 173. ♀.
- cypris** (Blake). N. J., W. Va., Ga., Fla., Miss., Mo., Minn. Host: *Bembix cinerea* Handl.  
*Mutilla* (*Sphaerophthalma*) *Cypris* Blake, 1871. Amer. Ent. Soc., Trans. 3: 246. ♀.  
*Dasytmilla mutata niamensis* Rohwer, 1912. U. S. Natl. Mus., Proc. 41: 462. ♀.  
*Dasytmilla hora* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 196. ♂.
- Biology: Fattig, 1943. Emory Univ. Mus. Bul. 1: 4, 7 (host record, mating behavior).
- dammersi** Mickel. Calif. (Palm Springs).  
*Dasytmilla dammersi* Mickel, 1936. Pan-Pacific Ent. 12: 94. ♀.
- dawsoni** Mickel. Nebr. (Halsey).  
*Dasytmilla dawsoni* Mickel, 1936. Ent. Soc. Amer., Ann. 29: 40. ♀.
- digressa** Mickel. N. Mex. (Pecos).  
*Dasytmilla digressa* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 273. ♂.
- dilucida** Mickel. Ariz.  
*Dasytmilla dilucida* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 267. ♀.
- dionysia** Mickel. Ariz.  
*Dasytmilla dionysia* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 104. ♀.
- dorippa** Mickel. Nev. (Ormsby Co.).  
*Dasytmilla dorippa* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 297. ♂.
- dugei** (Cockerell and Casad). Kans., Colo., Tex., Ariz. Host: *Anthophora occidentalis* Cr.  
*Sphaerophthalma* (!) *dugei* Cockerell and Casad, 1894. Ent. News 5: 294. ♀.  
*Ephuta* (*Ephuta*) *Dugei* (!) Andre, 1903. In Wytsman, Gen. Ins., fasc. 11, p. 59.
- Biology: Krombein, 1967. U. S. Dept. Agr., Monog. 2, Sup. 2: 339 (host record).
- electra** (Blake). Tex., Okla.  
*Mutilla Electra* Blake, 1872. Amer. Ent. Soc., Trans. 4: 75. ♀.
- eminentia** Mickel. Ariz., Calif.; Mexico (Baja California).  
*Dasytmilla eminentia* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 79. ♂.

**errabunda** Mickel. Ariz., Calif.

*Dasytmutilla errabunda* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 269. ♂.

**eurynome** Mickel. Tex. (Valentine in Presidio Co.).

*Dasytmutilla eurynome* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 209. ♀.

**fasciventris** Mickel. Ariz. (Globe).

*Dasytmutilla fasciventris* Mickel, 1938. Ent. Soc. Amer., Ann. 31: 155. ♂.

**ferruginea** (Smith). Ariz.; Mexico (Puebla, Oaxaca).

*Mutilla ferruginea* Smith, 1879. Descr. New Species Hym. Brit. Mus., p. 226. ♀.

*Dasytmutilla chrysocoma* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 266. ♀.

Taxonomy: Mickel, 1965. Ent. Soc. Wash., Proc. 67: 3 (synonymy).

**flammitifera** Mickel. Idaho, Oreg., Calif., Ariz.

*Dasytmutilla flammitifera* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 240. ♀.

**foxi** (Cockerell). N. Mex., Ariz. Host: *Diadasia diminuta* (Cr.).

*Sphaerophthalma* (!) *foxi* Cockerell, 1894. Ent. News 5: 199. ♂.

*Sphaerophthalma* (!) *heterochroa* Cockerell and Casad, 1894. Ent. News 5: 298. ♀.

*Sphaerophthalma* (!) *foxi* var. *arizonica* Cockerell, 1900. Entomologist 33: 65. ♀.

Biology: Cockerell, 1896. Nature 54: 461.

**fulgida** Mickel. Ariz. Possibly a synonym of *erythrina* (Say) from Mexico.

*Dasytmutilla fulgida* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 76. ♀.

Taxonomy: Mickel, 1974. Ent. Soc. Amer., Ann. 67: 470. ♂.

**furina** Mickel. Ariz. (Douglas).

*Dasytmutilla furina* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 82. ♀.

**gentilis** Mickel. Kans., Tex., Rocky Mts.

*Dasytmutilla gentilis* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 199. ♂.

**gibbosa** (Say). N. H. south to Ga., west to Minn. and Mo.

*Mutilla* (*Ephuta*) *gibbosa* Say, 1836. Boston Jour. Nat. Hist. 1: 298. ♂.

*Mutilla cariniceps* Fox, 1899. Amer. Ent. Soc., Trans. 25: 241. ♀.

*Dasytmutilla scrobinata* Rohwer, 1912. U. S. Natl. Mus., Proc. 41: 462. ♀.

*Dasytmutilla cariniceps* (!) Fattig, 1943. Emory Univ. Mus. Bul. 1: 9, 16. ♀.

**gloriosa** (Saussure). Tex., Utah, Nev., Ariz., Calif.; Mexico (Baja California). Host:

*Microbembex nigrifrons* (Prov.).

*Mutilla gloriosa* Saussure, 1868 (1867). Soc. Ent. France, Ann. (4) 7: 359. ♀.

*Mutilla tecta* Cresson, 1875. Amer. Ent. Soc., Trans. 5: 119. ♀.

*Dasytmutilla reperticia* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 287. ♂.

Taxonomy: Mickel, 1936. Ent. Soc. Amer., Ann. 29: 56 (synonymy).

Biology: Haddock, 1967. In Krombein, U. S. Dept. Agr., Monog. 2, Sup. 2: 339 (host record).

**glycera** Mickel. Ariz. (Florence).

*Dasytmutilla glycera* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 299. ♂.

**gorgon** (Blake). La., Okla., Tex., N. Mex.

*Mutilla* (*Sphaerophthalma*) *Gorgon* Blake, 1871. Amer. Ent. Soc., Trans. 3: 233. ♀.

*Mutilla Tisiphone* Blake, 1879. Amer. Ent. Soc., Trans. 7: 249. ♀.

*Dasytmutilla gorgons* (!) Ashmead, 1899. N. Y. Ent. Soc., Jour. 7: 57, 60. ♀, ♂.

**hector** (Blake). Iowa, Nebr., Kans., Colo.

*Mutilla* (*Sphaerophthalma*) *Hector* Blake, 1871. Amer. Ent. Soc., Trans. 3: 237. ♂.

**heliophila** (Cockerell). Ariz., Calif.

*Sphaerophthalma* (!) *heliophila* Cockerell, 1900. Entomologist 33: 65. ♀.

*Dasytmutilla welltonensis* Bradley and Bequaert, 1923. Amer. Mus. Novitates 82: 1. ♀.

**hersilia** Mickel. Tex. (Bexar Co.).

*Dasytmutilla hersilia* Mickel, 1936. Ent. Soc. Amer., Ann. 29: 51. ♂.

**hispidaria** Mickel. Tex. (Hondo).

*Dasytmutilla hispidaria* Mickel, 1936. Ent. Soc. Amer., Ann. 29: 55. ♀.

**homole** Mickel. N. Mex. (Organ Mts.).

*Dasytmutilla homole* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 72. ♀.



**intermixta** Mickel. N. Mex., Ariz.

*Dasyutilla intermixta* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 256. ♂.

**interrupta** Banks. Mass. south to Ga., west to N. Dak. and Colo.

*Dasyutilla cypris* var. *interrupta* Banks, 1921. Ent. Soc. Amer., Ann. 14: 24. ♀.

Taxonomy: Krombein, 1953. Wasmann Jour. Biol. 10: 310. ♂.

**klugii** (Gray). Kans. south to Tex., west to Utah and Ariz. Host: *Sphecius grandis* (Say).

*Mutilla Klugii* Gray, 1872. In Griffith, Cuvier's Animal Kingdom 15 (Insecta 2), p. 516. ♀.

*Mutilla Orcus* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 428. ♀, ♂.

Biology: Bradley, 1920. Ent. News 31: 112-113 (host record).

**klugoides** Mickel. Okla., Tex.

*Dasyutilla klugoides* Mickel, 1936. Ent. Soc. Amer., Ann. 29: 54. ♀.

**leda** (Blake). S. Dak. south to Tex., Colo., N. Mex.

*Mutilla (Sphaerophthalma) Leda* Blake, 1872. Amer. Ent. Soc., Trans. 4: 72. ♀.

*Mutilla prognoides* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 186. ♀.

**lepeletierii** (Fox). Mass. south to Fla., west to Iowa and Tex.

*Mutilla fenestrata* Lepeletier, 1845. Hist. Nat. Ins. Hym., v. 3, p. 627. ♂. Preocc.

*Mutilla Lepeletierii* Fox, 1899. Amer. Ent. Soc., Trans. 25: 244. N. name.

*Mutilla vierecki* Rohwer, 1910. Ent. Soc. Wash., Proc. 12: 49. ♀.

*Dasyutilla ferrugata* var. *balabetei* Rohwer, 1912. U. S. Natl. Mus., Proc. 41: 456. ♀.

*Dasyutilla georgiana* Rohwer, 1912. U. S. Natl. Mus., Proc. 41: 456. ♀.

*Dasyutilla plesia* Rohwer, 1912. U. S. Natl. Mus., Proc. 41: 456. ♀.

*Dasyutilla (Dasyutilla) ferrugata* var. *ballabetei* (!) Bradley, 1916. Amer. Ent. Soc., Trans. 42: 327. ♀.

Biology: Shappirio, 1948. Brooklyn Ent. Soc., Bul. 42: 163 (mating).

**macilenta** (Blake). Ga., Fla., Tex.

*Mutilla (Sphaerophthalma) macilenta* Blake, 1871. Amer. Ent. Soc., Trans. 3: 239. ♂.

**macra** (Cresson). N. Dak. south to Ark., west to Alta. and N. Mex.

*Mutilla macra* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 429. ♂.

*Sphaerophthalma* (!) *hispida* Blake, 1886. Amer. Ent. Soc., Trans. 13: 226. ♂.

**magna** (Cresson). Ariz., Calif.; Mexico (Baja California).

*Mutilla magna* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 385. ♀.

**magnifica** Mickel. N. Mex., Ariz., Nev., Calif.; Mexico (Baja California).

*Dasyutilla magnifica* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 234. ♀, ♂.

**medea** (Cresson). Colo., N. Mex. Host: *Microbember monodonta* (Say)?

*Mutilla Medea* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 432. ♀.

Biology: Melander, 1903. Amer. Ent. Soc., Trans. 29: 297 (host ?).

**megalophthalma** Mickel. Ariz., Calif. *D. arenivaga* Mick. may be the female.

*Dasyutilla megalophthalma* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 282. ♂.

**melanippe** Mickel. Tex.

*Dasyutilla melanippe* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 152. ♀.

*Dasyutilla lauta* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 154. ♀.

Taxonomy: Mickel, 1936. Ent. Soc. Amer., Ann. 29: 46 (synonymy).

**melanippe** var. **conformis** Mickel. Tex.

*Dasyutilla melanippe* var. *conformis* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 153. ♀.

**meracula** Mickel. Kans., Okla., Tex.

*Dasyutilla meracula* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 201. ♂.

**monticola** (Cresson). Minn. south to Kans., west to B. C. and Ariz.

*Mutilla monticola* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 430. ♂.

*Mutilla eximia* Blake, 1886. Amer. Ent. Soc., Trans. 13: 200. ♂.

*Ephuta boulderensis* Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 133. ♂.

**montivagoides** (Viereck). Kans. (Hamilton Co.).

*Mutilla (Timulla) montivagoides* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 185. ♀.

**mutata** (Blake). N. Y. south to Fla., west to Mo. and Tex. Host: *Myzinum obscurum* (F.).

*Mutilla (Sphaerophthalma) mutata* Blake, 1871. Amer. Ent. Soc., Trans. 3: 247. ♀.

*Dasytmilla allardi* Rohwer, 1912. U. S. Natl. Mus., Proc. 41: 463. ♀.

*Dasytmilla rubricosa* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 192. ♂.

Taxonomy: Mickel, 1938. Ent. Soc. Amer., Ann. 31: 152. ♀.

Biology: Fattig, 1943. Emory Univ. Mus. Bul. 1: 4, 7 (host record, mating).

**myrice** Mickel. Nebr., Kans., Okla., Tex., Colo.

*Dasytmilla myrice* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 121. ♂.

**nigricauda** (Viereck). Kans., Okla., Tex.

*Mutilla (Timulla) nigricauda* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 187. ♀.

**nigripes** (Fabricius). Mass. to Fla., west to Alta. and Ariz. Host: *Philanthus gibbosus* (F.)?, *Cerceris f. flavofasciata* Sm.

*Mutilla nigripes* Fabricius, 1787. Mantissa Insectorum, v. 1, p. 313. ♀.

*Mutilla sparsa* Fox, 1899. Amer. Ent. Soc., Trans. 25: 240. ♀.

*Dasytmilla blawa* Rohwer, 1912. U. S. Natl. Mus., Proc. 41: 457. ♀.

*Dasytmilla segregata* Rohwer, 1912. U. S. Natl. Mus., Proc. 41: 459. ♀.

*Dasytmilla segregata finni* Rohwer, 1912. U. S. Natl. Mus., Proc. 41: 459. ♀.

*Dasytmilla bruneri* Rohwer, 1912. U. S. Natl. Mus., Proc. 41: 460. ♀.

*Dasytmilla champlaini* Rohwer, 1912. U. S. Natl. Mus., Proc. 41: 461. ♀.

*Dasytmilla hirticula* Mickel, 1923. Minn. State Ent. Rpt. 19: 107. ♂.

Taxonomy: Mickel, 1936. Ent. Soc. Amer., Ann. 29: 43-44 (synonymy).

Biology: Shappirio, 1948. Brooklyn Ent. Soc., Bul. 42: 163 (mating behavior). —Shappirio, 1949. Brooklyn Ent. Soc., Bul. 43: 158 (host record). —Krombein, 1959. Ent. Soc. Wash., Proc. 61: 198 (host record). —Evans and Miller, 1969. Mich. Ent. 2: 74 (adult female overwintering). —Evans, Miller and Bartlett, 1973. Kans. Ent. Soc., Jour. 46: 343-346 (host searching range).

**nitidula** Mickel. Kans., Okla., Tex.

*Dasytmilla nitidula* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 174. ♀.

**nitidula var. nigridia** Mickel. Tex.

*Dasytmilla nitidula var. nigridia* Mickel, 1936. Ent. Soc. Amer., Ann. 29: 47. ♀.

**nocturna** Mickel. Calif., Nev.

*Dasytmilla nocturna* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 279. ♀.

**nogalensis** Mickel. Ariz.

*Dasytmilla nogalensis* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 258. ♀.

**nupera** Mickel. Tex., N. Mex.

*Dasytmilla nupera* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 103. ♀.

**occidentalis comanche** (Blake). Iowa and S. Dak., south to Tex., Colo., Ariz., west to Idaho and Oreg.

*Mutilla (Sphaerophthalma) Comanche* Blake, 1871. Amer. Ent. Soc., Trans. 3: 234. ♀, ♂.

**occidentalis occidentalis** (Linnaeus). Conn. south to Fla., west to Mo. and Tex. Host: *Bombus fraternus* Smith.

*Mutilla occidentalis* Linnaeus, 1758. Syst. Nat., ed. 10, v. 1, p. 582. ♀.

*Mutilla bifasciata* Swederus, 1787. Svensk. Vetensk. Akad. Handl. 8: 285. ♀.

*Mutilla coccinea* Fabricius, 1793. Ent. System. 2: 366. ♀.

Biology: Fattig, 1943. Emory Univ. Mus. Bul. 1: 5 (host).

**ocydrome** Mickel. Ariz.

*Dasytmilla ocydrome* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 292. ♂.

**paenulata** Mickel. Ariz., Calif.

*Dasytmilla paenulata* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 206. ♀.

**paranocturna** Barr and Hurd. Calif.

*Dasytmilla paranocturna* Barr and Hurd, 1947. Pan-Pacific Ent. 23: 88. ♀.

**parksii** Mickel. Tex. (Bexar Co.).

*Dasytmilla parksii* Mickel, 1936. Ent. Soc. Amer., Ann. 29: 50. ♀.

**perilla** Mickel. Tex.

*Dasyutilla perilla* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 300. ♂.

**perilla** var. **gentilicia** Mickel. Kans., Colo.

*Dasyutilla perilla* var. *gentilicia* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 301. ♂.

**phaon** (Fox). Tex., N. Mex., Ariz., Utah.

*Mutilla phaon* Fox, 1899. Amer. Ent. Soc., Trans. 25: 243. ♂.

**phaon** var. **fimbrialis** Mickel. Utah, Ariz., Calif.

*Dasyutilla phaon* var. *fimbrialis* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 302. ♂.

**phoenix** (Fox). Ariz., Calif. Host: *Ptilothrix sumichrasti* (Cr.).

*Mutilla phoenix* Fox, 1899. Amer. Ent. Soc., Trans. 25: 247. ♀.

Biology: Krombein, 1958. U. S. Dept. Agr., Monog. 2, Sup. 1: 104 (host record).

**polia** Mickel. Ariz.

*Dasyutilla polia* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 215. ♂.

**praegrans** Mickel. Tex.

*Dasyutilla praegrans* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 148. ♀, ♂.

**praegrans** var. **russata** Mickel. Tex.

*Dasyutilla praegrans* var. *russata* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 152. ♂.

**pseudopappus** (Cockerell). Colo., N. Mex., Ariz., Calif.

*Sphaerophthalma* (!) *gloriosa* var. *pseudopappus* Cockerell, 1895. Psyche 7(sup.): 6. ♀.

**pyrrhus** (Fox). Ga., Fla. Host: Sp. of Bembicini.

*Mutilla pyrrhus* Fox, 1899. Amer. Ent. Soc., Trans. 25: 243. ♂.

Biology: Krombein, 1964. Amer. Mus. Novitates 2201: 2-4, fig. 1 (host record).

**quadriguttata** (Say). Ill., Minn., and S. Dak. south to Miss. and Tex. Host: *Myzinum quinquenotatum* (F.).

*Mutilla quadriguttata* Say, 1823. West. Quart. Rptr. 2: 74. ♀.

*Dasyutilla permista* Mickel, 1923. Minn. State Ent. Rpt. 19: 108. ♂.

Taxonomy: Remington, 1944. Ent. Soc. Amer., Ann. 37: 198-200 (synonymy).

Biology: Swezey, 1915. Hawaii Ent. Soc., Proc. 3: 72 (host record; misdet. as *castor* Blake.)

—Hayes, 1924. Brooklyn Ent. Soc., Bul. 19: 153 (host).

**reclusa** Mickel. S. Dak. south to Tex., Mont., Wyo.

*Dasyutilla reclusa* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 219. ♂.

**rubicunda** Bradley. Ga., Fla.

*Dasyutilla* (*Dasyutilla*) *rubicunda* Bradley, 1916. Amer. Ent. Soc., Trans. 42: 325. ♀.

*Dasyutilla beameri* Mickel, 1936. Ent. Soc. Amer., Ann. 29: 48. ♀.

**sackenii** (Cresson). Oreg., Calif., Nev.; Mexico (Baja California). Host: *Bembix occidentalis beutenmulleri* Fox.

*Mutilla sackenii* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 385. ♀.

*Mutilla erudita* Cresson, 1875. Amer. Ent. Soc., Trans. 5: 120. ♀.

Biology: Bohart and MacSwain, 1939. South. Calif. Acad. Sci., Bul. 38: 89, pl. 16, figs. 11-14 (life history).

**saetigera** Mickel. Ariz. (Baboquivari Mts.).

*Dasyutilla saetigera* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 211. ♀.

**satanas** Mickel. Ariz., Nev., Calif.; Mexico (Baja California).

*Dasyutilla satanas* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 239. ♀.

*Dasyutilla mimula* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 255. ♂.

Taxonomy: Barr and Hurd, 1947. Pan-Pacific Ent. 23: 86. ♀, ♂.

**scaevola** (Blake). Mass. south to Ga., west to Mont. and Ariz. Host: *Cerceris clypeata* Dahlb., *C. finitima* Cr.?

*Mutilla* (*Sphaerophthalma*) *obscura* Blake, 1871. Amer. Ent. Soc., Trans. 3: 239. ♂. Preocc.

*Mutilla* (*Sphaerophthalma*) *scaevola* Blake, 1871. Amer. Ent. Soc., Trans. 3: 247. ♀.

*Mutilla* (*Sphaerophthalma*) *admetus* Blake, 1872. Amer. Ent. Soc., Trans. 4: 74. ♂.

*Sphaerophthalma* (!) *macer* (!) Blake, 1886. Amer. Ent. Soc., Trans. 13: 227. ♂.

*Sphaerophthalma* (!) *macerata* Blake, 1886. Amer. Ent. Soc., Trans. 13: 286. Emend.

- Mutilla macera* (!) Dalla Torre, 1897. Cat. Hym., v. 8, p. 56.  
*Mutilla (Dasytmutilla) apachea* Viereck, 1908. Amer. Ent. Soc., Trans. 33: 386. ♂.
- Biology: Shappirio, 1948. Brooklyn Ent. Soc., Bul. 42: 162-163 (host record). —Shappirio, 1949. Brooklyn Ent. Soc., Bul. 43: 157-158 (host records).
- scitula* Mickel. Utah, Nev., Calif.  
*Dasytmutilla scitula* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 244. ♀, ♂.
- serenitas* Mickel. Tex. (Cotulla, Eastland Co.).  
*Dasytmutilla serenitas* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 289. ♂.
- sicheliana* (Saussure). Ariz.; Mexico (Durango).  
*Mutilla Sicheliana* Saussure, 1868 (1867). Soc. Ent. France, Ann. (4) 7: 360. ♀.  
*Sphaerophthalma* (!) *prunotincta* Cockerell, 1895. Ent. News 6: 60. ♀.  
*Sphaerophthalma* (!) *thera* Cameron, 1895. Biol. Cent.-Amer., Hym., v. 2, p. 358. ♀. Preocc. in *Mutilla*.  
*Mutilla gynaeccologica* Dalla Torre, 1897. Cat. Hym., v. 8, p. 45. N. name.
- Taxonomy: Mickel, 1965. Ent. Soc. Wash., Proc. 67: 3 (synonymy).
- snoworum* (Cockerell). Nebr. south to Tex., west to Mont. and Ariz.  
*Sphaerophthalma* (!) *snoworum* Cockerell, 1897. In Cockerell and Fox, Acad. Nat. Sci. Phila., Proc. 49: 135. ♂.  
*Mutilla poecilonota* Melander, 1903. Amer. Ent. Soc., Trans. 29: 301. ♀.
- sophrona* Mickel. Ariz.  
*Dasytmutilla sophrona* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 271. ♂.
- stevensi* Mickel. Iowa, N. Dak., south to Tex., Colo., Utah, N. Mex., Ariz.  
*Dasytmutilla stevensi* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 99. ♀.  
*Dasytmutilla medora* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 101. ♂.
- Taxonomy: Mickel, 1936. Ent. Soc. Amer., Ann. 29: 44 (synonymy).
- subhyalina* Mickel. Calif. (Andrade).  
*Dasytmutilla subhyalina* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 281. ♂.
- sulcatulla* Mickel. Tex. (Rio Grande in Brewster Co.).  
*Dasytmutilla sulcatulla* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 155. ♀.
- testaceiventris* (Fox). Oreg., Calif.  
*Mutilla testaceiventris* Fox, 1899. Amer. Ent. Soc., Trans. 25: 242. ♂.
- texanella* Mickel. Kans., Tex., Colo.  
*Mutilla texana* Blake, 1879. Amer. Ent. Soc., Trans. 7: 250. ♀. Preocc.  
*Dasytmutilla texanella* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 96. ♀. N. name.
- thetis* (Blake). Ariz.  
*Sphaerophthalma* (!) *thetis* Blake, 1886. Amer. Ent. Soc., Trans. 13: 214. ♀.
- vandala* Mickel. Tex.  
*Dasytmutilla vandala* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 74. ♂.
- vesta errans* Rohwer. S. Dak. south to Tex., Colo.  
*Dasytmutilla errans* Rohwer, 1912. U. S. Natl. Mus., Proc. 41: 457. ♀.  
*Dasytmutilla bosquensis* Rohwer, 1912. U. S. Natl. Mus., Proc. 41: 457. ♀.  
*Dasytmutilla texensis* Rohwer, 1912. U. S. Natl. Mus., Proc. 41: 460. ♀.
- vesta sappho* (Fox). N. C. south to Fla., Miss. Host: *Bembix cinerea* Handl.  
*Mutilla sappho* Fox, 1899. Amer. Ent. Soc., Trans. 25: 239. ♀.
- Biology: Krombein, 1958. U. S. Dept. Agr., Monog. 2, Sup. 1: 104 (host).
- vesta vesta* (Cresson). East of Rocky Mts. in Canada and U. S. Host: *Trypargilum politum* (Say); *Nomia m. melanderi* Ckll.  
*Mutilla Vesta* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 436. ♀.  
*Scolia uncinata* Provancher, 1882. Nat. Canad. 13: 6. ♂ (♀ misdet.).  
*Mutilla monozona* Dalla Torre, 1897. Cat. Hym., v. 8, p. 64. N. name for *Scolia uncinata* Provancher, not *Mutilla uncinata* Lucas.  
*Mutilla agenor* Fox, 1899. Amer. Ent. Soc., Trans. 25: 245. ♂.  
*Mutilla zella* Rohwer, 1910. Ent. Soc. Wash., Proc. 12: 50. ♀.  
*Pycnomutilla harmoniiformis* Rohwer, 1912. U. S. Natl. Mus., Proc. 41: 455. ♂.

- Dasytmilla ferrugatella* Rohwer, 1912. U. S. Natl. Mus., Proc. 41: 458. ♀.  
*Dasytmilla coloradella* Rohwer, 1912. U. S. Natl. Mus., Proc. 41: 458. ♀.  
*Dasytmilla coloradella virginica* Rohwer, 1912. U. S. Natl. Mus., Proc. 41: 459. ♀.  
*Dasytmilla coloradella kamloopsensis* Rohwer, 1912. U. S. Natl. Mus., Proc. 41: 459. ♀.  
*Dasytmilla mesillae* Rohwer, 1912. U. S. Natl. Mus., Proc. 41: 461. ♀.  
*Dasytmilla carolina* Rohwer, 1912. U. S. Natl. Mus., Proc. 41: 462. ♀.

Biology: Fattig, 1943. Emory Univ. Mus. Bul. 1: 4 (host record). —Krombein, 1958. U. S. Dept. Agr., Monog. 2, Sup. 1: 104 (host record).

**vestita** (Lepeletier). N. Dak. south to Tex., west to Alta. and Calif., south in Mexico to Oaxaca.

Host: *Anthophora occidentalis* (Cr.), *Diadasia enacata* (Cr.); *Megachile perihirta* Ckll.

*Mutilla vestita* Lepeletier, 1845. Hist. Nat. Ins. Hym., v. 3, p. 634. ♀, ♂.

*Mutilla montezumae* Lepeletier, 1845. Hist. Nat. Ins. Hym., v. 3, p. 634. ♀.

*Mutilla fulvohirta* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 433. ♂.

*Sphaerophthalma* (?) *townsendi* Cockerell, 1894. Ent. News 5: 199. ♂.

*Sphaerophthalma* (?) *aspasia* Cameron, 1895. Biol. Cent.-Amer., Hym., v. 2, p. 370. ♂.

Preocc. in *Mutilla*.

*Mutilla aspasioides* Dalla Torre, 1897. Cat. Hym., v. 8, p. 12. N. name.

*Epitha californica* var. *euchroa* Cockerell, 1897. Ann. and Mag. Nat. Hist. (6) 20: 513. ♀.

Taxonomy: Mann, 1915. Psyche 22: 178, fig. 1 (gynandromorph).

Biology: Mickel, 1928. U. S. Natl. Mus., Bul. 143: 72. —Krombein, 1958. U. S. Dept. Agr., Monog. 2, Sup. 1: 104 (host records).

**waco** (Blake). Tex.

*Mutilla* (*Sphaerophthalma*) *Waco* Blake, 1871. Amer. Ent. Soc., Trans. 3: 238. ♀.

**wileyae** Mickel. Tex.

*Dasytmilla wileyae* Mickel, 1928. U. S. Natl. Mus., Bul. 143: 177. ♀.

**zelaya** (Blake). Okla., Tex., N. Mex., Ariz.

*Mutilla* (*Sphaerophthalma*) *Zelaya* Blake, 1871. Amer. Ent. Soc., Trans. 3: 234. ♂.

### Genus LOMACHAETA Mickel

*Lomachaeta* Mickel, 1936. Ent. Soc. Amer., Ann. 29: 289.

Type-species: *Lomachaeta hicksi* Mickel. Orig. desig.

Revision: Mickel, 1940. Pan-Pacific Ent. 16: 127-131.

**coloradensis** Mickel. Colo. (Boulder Co.).

*Lomachaeta coloradensis* Mickel, 1936. Ent. Soc. Amer., Ann. 29: 292. ♂.

**formosula** Mickel. Ga. (Clarke Co.); Mexico (Coahuila).

*Lomachaeta formosula* Mickel, 1940. Pan-Pacific Ent. 16: 130. ♂.

**hicksi** Mickel. Calif.

*Lomachaeta hicksi* Mickel, 1936. Ent. Soc. Amer., Ann. 29: 289. ♀, ♂.

**minutula** Mickel. Okla., Tex. (Type from Tenn., Mo. or Ark.).

*Lomachaeta minutula* Mickel, 1936. Ent. Soc. Amer., Ann. 29: 294. ♀.

**punctinota** Mickel. Ill. (Carbondale).

*Lomachaeta punctinota* Mickel, 1936. Ent. Soc. Amer., Ann. 29: 293. ♂.

**variegata** Mickel. Wash., Calif., Nev., Ariz., N. Mex. Host: *Solierella plenoculoides similis* (Brid.), *S. blaisdelli* (Brid.), nesting in stems of *Eriogonum elatum*.

*Lomachaeta variegata* Mickel, 1940. Pan-Pacific Ent. 16: 128. ♀, ♂.

Biology: Parker, 1962. Pan-Pacific Ent. 38: 116 (host records). —Parker and Bohart, 1966. Pan-Pacific Ent. 42: 95 (host records).

### Genus SMICROMUTILLA Mickel

*Smicromutilla* Mickel, 1964. Pan-Pacific Ent. 40: 108.

Type-species: *Smicromutilla powelli* Mickel. Orig. desig.

**powelli** Mickel. Calif. (San Luis Obispo Co.). Host: *Diodontus occidentalis* Fox?

*Smicromutilla powelli* Mickel, 1964. Pan-Pacific Ent. 40: 108, 1 fig. ♂, ♀.

## UNPLACED TAXA OF MUTILLIDAE

- Mutilla contracta* Say, 1836. Boston Jour. Nat. Hist. 1: 295. ♂. Type destroyed.  
*Mutilla exulans* Fabricius, 1775. Systema Ent., p. 397. ♀. Described from Drury coll.; type probably lost.  
*Mutilla versicolor* Fabricius, 1775. Systema Ent., p. 398. ♀. Described from Drury coll.; type probably lost.  
*Mutilla vigilans* Say, 1836. Boston Jour. Nat. Hist. 1: 296. ♂. Type destroyed.

## Family SCOLIIDAE

The scoliid wasps are external parasites of larvae of Scarabaeidae in the soil or in debris of wood-rat nests. Members of some exotic genera parasitize scarabaeid larvae in decaying wood.

Morphology: Betrem, 1972 (1971). Nederland. Ent. Ver., Monog. 6: 13-20, 6 figs. (adults).

## SUBFAMILY CAMPSOMERINAE

Revision: Betrem, 1972 (1971). Nederland. Ent. Ver., Monog. 6: 1-326, 6pls. (African species; erects tribal classification).

## TRIBE TRIELIDINI

Taxonomy: Bradley, 1950. Eos, Tomo extraord., pp. 427-438 (primitive character of group).  
 —Betrem, 1972 (1971). Nederland. Ent. Ver., Monog. 6: 26.

## Genus TRIELIS Saussure

Revision: Bradley, 1928. Amer. Ent. Soc., Trans. 54: 195-214, 4 text figs., pl. 22.

Taxonomy: Betrem, 1962. Ent. News 73: 146.

## Genus TRIELIS Subgenus TRIELIS Saussure

*Trielis* Saussure, 1863. Soc. Ent. France, Ann. (4) 3: 18.

Type-species: *Elis xantiana* Saussure. Monotypic.

*Campsoscolia* Betrem, 1933. Stettin. Ent. Ztg. 94: 240.

Type-species: *Scolia sexmaculata* Fabricius. Orig. desig.

Only the typical subgenus occurs in North America. Our species belong to Species Group Interrupta which is found also in the Palaearctic Region.

Taxonomy: Betrem, 1962. Ent. News 73: 146 (type species).

*octomaculata hermione* (Banks). Austrorip., N. J. to Fla., Ala., Ill.

*Trielis hermione* Banks, 1912. Canad. Ent. 44: 200. ♂.

*octomaculata octomaculata* (Say). U. Austr. Zone west of Allegheny Mts. and east of 100th Meridian.

*Scolia viii, maculata* Say, 1823. West. Quart. Rptr. 2: 74. ♀.

*Scolia octo-maculata* Say, 1825. American Entomology, pl. 29. Emend.

*octomaculata texensis* (Saussure). U. and L. Sonoran Zones.

*Elis texensis* Saussure, 1858. Soc. Ent. France, Ann. (3) 6: 224. ♂.

*Scolia regina* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 447. ♀.

*Scolia consors* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 449. ♂. Preocc.

*Scolia flavosignata* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 449. ♂.

*Elis (Trielis) zonaria* Cresson, 1868. Amer. Ent. Soc., Trans. 1: 378. N. name.

*Elis lupina* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 202. ♀.

*pollenifera* (Viereck). Kans., N. Mex., Ariz.

*Elis (Trielis) pollenifera* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 190. ♀.

*Elis (Trielis) pollenifera* var. *a* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 191. ♀, ♂.

## Genus CRIOSCOLIA Bradley

*Crioscolia* Bradley, 1950. Eos, Tomo extraord., p. 431.

Type-species: *Campsomeris (Trielis) flammicomma* Bradley. Orig. desig.

Only the typical subgenus occurs in North America.

**alcione** (Banks). U. Sonoran Zone.

*Trielis alcione* Banks, 1917. Mus. Compar. Zool., Bul. 61: 112. ♂.

**flammicoma** (Bradley). L. Sonoran Zone.

*Campsomeris (Trielis) flammicoma* Bradley, 1928. Amer. Ent. Soc., Trans. 54: 209. ♀, ♂.

#### TRIBE CAMPSOMERINI

Taxonomy: Betrem, 1972 (1971). Nederland. Ent. Ver., Monog. 6: 76.

#### Genus CAMPSOMERIS Guerin

Taxonomy: Bradley, 1957. Amer. Ent. Soc., Trans. 83: 65-77 (subgeneric reclassification Amer. spp.). — Bradley, 1964. Ent. News 75: 101-108 (added notes on subgenera and spp.).

#### Genus CAMPSOMERIS Subgenus CAMPSOMERIS Guerin

*Campsomeris* Guerin, 1838. In Duperrey, Voy. Coquille, Zool., v. 2, p. 247.

Type-species: *Scolia atrata* Fabricius. Desig. by Bequaert, 1926.

*Colpa* Lepeletier, 1845. Hist. Nat. Ins. Hym., v. 3, p. 534.

Type-species: *Colpa peregrina* Lepeletier. Desig. by Betrem, 1928.

The typical subgenus does not occur in North America.

#### Genus CAMPSOMERIS Subgenus DIELIS Saussure and Sichel

*Elis* subg. *Dielis* Saussure and Sichel, 1864. Cat. Spec. Gen. Scol., p. 14.

Type-species: *Scolia radula* Fabricius. Desig. by Betrem, 1928.

Revision: Bradley, 1928. Acad. Nat. Sci. Phila., Proc. 80: 313-337, 2 text figs., pl. 26.

Taxonomy: Betrem, 1962. Ent. News 73: 207 (type of *Dielis*).

#### SPECIES GROUP PLUMIPES

Taxonomy: Bradley, 1957. Amer. Ent. Soc., Trans. 83: 69.

**plumipes confluenta** (Say). U. Austr. between Allegheny and Rocky Mts. Ecology: On flowers of *Rubus*, *Arabis*, *Melilotus*, *Solidago*, and *Cephalanthus*. Host: *Cotalpa lanigera* (L.).

*Scolia confluenta* Say, 1823. West. Quart. Rptr. 2: 74. ♀.

Biology: Kurczewski, 1963. Ent. News 74: 21-24 (host record). — Kurczewski, 1966. Kans.

Ent. Soc., Jour. 39: 156 (host record). — Kurczewski, 1967. Kans. Ent. Soc., Jour. 40:

208-209 (host record).

**plumipes fossulana** (Fabricius). Austrorip. from Md. to Fla., west to Tex.

*Scolia fossulana* Fabricius, 1805. Systema Piezatorum, p. 242. ♀.

*Campsomeris szetschuanensis* forma *D* Betrem, 1932. Ent. Ber. 9: 414. ♂.

Taxonomy: Betrem, 1964. In Bradley, Spolia. Zool. Mus. Hauniensis 21: 35 (synonymy).

**plumipes plumipes** (Drury). Carol. Zone from Mass. to Ga., Ky.

*Spheg plumipes* Drury, 1770. Illus. Nat. Hist., v. 1, p. 104, pl. 44, fig. 5. ♀.

*Scolia radula* Fabricius, 1775. Systema Ent., p. 355. N. name for *plumipes*. Preocc. in

*Campsomeris* by *Tiphia radula* Fabricius, 1775, p. 354.

*Scolia quadricincta* Klug, 1805. In Weber and Mohr, Beitr. z. Naturk. 1: 37. ♀.

Taxonomy: Bradley, 1964. Spolia Zool. Mus. Hauniensis 21: 23 (nomenclature *radula*).

— Betrem, 1964. In Bradley, Spolia Zool. Mus. Hauniensis 21: 34-35 (*radula* specimens in Fabricius' collection). — Bradley, 1967. In Bradley and Betrem, Deut. Ent. Ztschr. 15: 331 (lectotype *quadricincta*).

**tolteca** (Saussure). Tex., Ariz., Calif., south into Mexico, Haiti.

*Elis toteca* Saussure, 1857. Rev. Mag. Zool. (2) 9: 282. ♀.

*Elis dives* Provancher, 1888. Addit. Corr. Faune Ent. Canada Hym., p. 410. ♀.

*Elis 4-cincta* Provancher, 1888. Addit. Corr. Faune Ent. Canada Hym., p. 411. ♂.

*trifasciata nassauensis* Bradley. Fla. (Key Vaca); Bahamas.

*Campsomeris* (*Campsomeris*) *trifasciata nassauensis* Bradley, 1928. Acad. Nat. Sci. Phila., Proc. 80: 322. ♀, ♂.

*trifasciata trifasciata* (Fabricius). Fla. (Miami) and Greater Antilles.

*Tiphia trifasciata* Fabricius, 1793. Ent. System., v. 2, p. 226. ♀.

*Colpa Alexandri* Lepeletier, 1845. Hist. Nat. Ins. Hym., v. 3, p. 543. ♂.

Taxonomy: Bradley, 1964. Spolia Zool. Mus. Hauniensis 21: 26 (holotype *trifasciata*).

#### SPECIES GROUP PILIPES

Bradley (1964. Ent. News 75: 102) notes that a new subgenus will be described for this species group.

Taxonomy: Bradley, 1957. Amer. Ent. Soc., Trans. 83: 69-70.

*pilipes* (Saussure). U. and L. Sonor. Zones.

*Elis pilipes* Saussure, 1858. Soc. Ent. France, Ann. (3) 6: 246. ♀.

Biology: Linsley, 1946. Jour. Econ. Ent. 39: 27-28 (pollinating alfalfa; misdet. as *plumipes*).

#### Genus CAMPSOMERIS Subgenus XANTHOCAMPSOMERIS Bradley

*Campsomeris* subg. *Xanthocampsomeris* Bradley, 1957. Amer. Ent. Soc., Trans. 83: 70.

Type-species: *Tiphia tricineta* Fabricius. Orig. desig.

Revision: Rohwer, 1927. Wash. Acad. Sci., Jour. 17: 150-154.

**completa completa** Rohwer. Ariz. (Chiricahua and Santa Rita Mts.), Tex. (Hidalgo Co.);

Mexico to El Salvador. Another subsp. occurs in Mexico.

*Campsomeris* (*Campsomeris*) *completa* Rohwer, 1927. Wash. Acad. Sci., Jour. 17: 151. ♀.

**fulvohirta** (Cresson). Fla. (Miami); Cuba.

*Scolia* (*Elis*) *fulvohirta* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 119. ♀, ♂.

*Campsomeris* (*Campsomeris*) *fulvohirta* (!) Rohwer, 1927. Wash. Acad. Sci., Jour. 17: 154. ♀, ♂.

**limosa** (Burmeister). Ariz.; Mexico.

*Scolia limosa* Burmeister, 1853. Naturf. Gesell. Halle, Abhandl. 1 (4): 28. ♀, ♂.

*Dielis fulvopilosa* Banks, 1912. Canad. Ent. 44: 200. ♀.

Taxonomy: Krombein, 1951. U. S. Dept. Agr., Monog. 2: 776 (synonymy). —Bradley, 1966. In

Bradley and Betrem, 1966. Beitr. z. Ent. 16: 76 (lectotype *limosa*).

#### Genus CAMPSOMERIS Subgenus PYGODASIS Bradley

*Campsomeris* subg. *Pygodasis* Bradley, 1957. Amer. Ent. Soc., Trans. 83: 72.

Type-species: *Scolia quadrimaculata* Fabricius. Orig. desig.

#### SPECIES GROUP QUADRIMACULATA

**quadrimaculata** (Fabricius). Largely L. Austr. from Mass. south to Fla., west to Okla. and Tex.

*Vespa maculata* Drury, 1773. Illustr. Nat. Hist. 2: 74, pl. 39, fig. 2. ♀. Preocc.

*Scolia quadrimaculata* Fabricius, 1775. Syst. Ent., p. 355. ♀.

*Scolia quatuormaculata* Christ, 1791. Naturgesch. Class. Nomencl. Ins., p. 267. N. name.

*Scolia quadrinotata* Fabricius, 1805. Systema Piezatorum, p. 240. ♀.

*Scolia Abotii* Klug, 1810. In Weber and Mohr, Beitr. z. Naturk. 2: 213. ♂.

*Colpa Pensylvanica* Lepeletier, 1845. Hist. Nat. Ins. Hym., v. 3, p. 546. ♂.

*Elis quadriguttata* (!) Viereck, 1906. Amer. Ent. Soc., Trans. 32: 222.

*Campsomeris druryi* Cockerell, 1907. Entomologist 40: 50. N. name.

Taxonomy: Bradley, 1964. Spolia Zool. Mus. Hauniensis 21: 21-22 (*quadrinotata* nomenclature; notes that it is a variety of *quadrimaculata*). —Bradley, 1967. In Bradley and Betrem, Deut. Ent. Ztschr. 15: 324 (holotype *abotii*).



## SPECIES GROUP EPHIPPIMUM

**ephippium ephippium** (Say). Tex. (Victoria, Seguin); south to northern South America.

Another subsp. occurs in South America.

*Scolia ephippium* Say, 1837. Boston Jour. Nat. Hist. 1: 333. ♂.

*Scolia Pettitii* Guérin, 1838. In Duperrey, Voy. Coquille, Zool., v. 2, p. 249.

Taxonomy: Bradley, 1945. Ent. Venez., Bul. 4: 18 (notes on type series *pettitii* (!)).

—Krombein, 1949. U. S. Natl. Mus., Proc. 100: 56-57, figs. 4-12 (gynandromorph).

**Genus MICROMERIELLA Betrem**

*Micromeris* Betrem, 1967. In Bradley and Betrem, Brit. Mus. (Nat. Hist.), Bul., Ent. 20: 294. Preocc.

Type-species: *Scolia marginella* Klug. Orig. desig.

*Micromeriella* Betrem, 1972 (1971). Nederland. Ent. Ver., Monog. 6: 116. N. name.

This genus is not a member of the Nearctic fauna.

**marginella modesta** (Smith). Liberated in N. J., Conn., but not established; Philippines.

Introduced from Hawaii where it had been successfully established from the Philippines. Host: *Anomala orientalis* Waterh.

*Scolia modesta* Smith, 1855. Cat. Hym. Brit. Mus., v. 3, p. 91. ♀, (♂ misdet.).

*Scolia manilae* Ashmead, 1904. N. Y. Ent. Soc., Jour. 12: 8. ♀.

**Genus CAMPSOMERIELLA Betrem**

*Campsomeris* subg. *Campsomeriella* Betrem, 1941. Notes d'ent. Chin. 8, fasc. 4: 86.

Type-species: *Scolia thoracica* Fabricius. Orig. desig.

This genus is not a member of the Nearctic fauna.

**Genus CAMPSOMERIELLA Subgenus ANNULIMERIS Betrem**

*Campsomeriella* subg. *Annulimeris* Betrem, 1967. Ent. Ber. 27: 28.

Type-species: *Tiphia annulata* Fabricius. Orig. desig.

**annulata** (Fabricius). Liberated in N. J. but not established. Introduced from China and Japan.

Host: *Popilla japonica* Newm.

*Tiphia annulata* Fabricius, 1793. Ent. System., v. 2, p. 225. ♀.

*Campsomeris Servillei* Lepeletier, 1845. Hist. Nat. Ins. Hym., v. 3, p. 501. ♀. Preocc. (secondary homonym).

Biology: Clausen, King and Teranishi, 1927. U. S. Dept. Agr., Bul. 1429: 31-33 (life history).

—Clausen, Jaynes and Gardner, 1933. U. S. Dept. Agr., Tech. Bul. 366: 28-30 (life history).

## SUBFAMILY SCOLIINAE

**Genus SCOLIA Fabricius**

Revision: Bartlett, 1912. Ent. Soc. Amer., Ann. 5: 293-340, 2 pls.

Taxonomy: Hurd, 1952. Calif. Ins. Survey, Bul. 1: 141-152, 2 pls. (Calif. spp.).

**Genus SCOLIA Subgenus SCOLIA Fabricius**

*Scolia* Fabricius, 1775. Systema Ent., p. 355.

Type-species: *Scolia quadripunctata* Fabricius. Desig. by Latreille, 1810.

*Lacosi* Guérin, 1838. In Duperrey, Voy. Coquille, Zool., v. 2, p. 247.

Type-species: *Scolia quadripunctata* Fabricius. Desig. by Bequaert, 1926.

*Lisoca* Costa, 1858. Fauna Napoli Scoliid., p. 8.

Type-species: *Scolia quadripunctata* Fabricius. Desig. by Krombein, 1951.

The typical subgenus does not occur in North America.

## Genus SCOLIA Subgenus DISCOLIA Saussure

*Scolia* subg. *Discolia* Saussure, 1863. Soc. Ent. France, Ann. (4) 3: 18.

Type-species: *Scolia nobilitata* Fabricius. Desig. by Betrem and Bradley, 1964.

**bicincta** Fabricius. U. and L. Austr. Zones, east of 100th Meridian.

*Scolia bicincta* Fabricius, 1775. Systema Ent., p. 356.

*Scolia obscura* Klug, 1805. In Weber and Mohr., Beitr. z. Naturk. 1: 33.

*Scolia undata* Klug, 1810. In Weber and Mohr., Beitr. z. Naturk. 2: 212. ♀.

Taxonomy: Brimley, 1920. Ent. News 31: 261-262. —Bradley, 1964. Spolia Zool. Mus. Hauniensis 21: 10 (type series *bicincta*).

**consors** Saussure. Colo.; Mexico (Baja California).

*Scolia consors* Saussure, 1863. Soc. Ent. France, Ann. (4) 3: 18. ♂.

*Scolia amoena* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 447. ♂.

**dubia dubia** Say. U. and L. Austr. Zones, Mass. to Fla., west to Colo. and Ariz. Host: *Cotinis nitida* (L.)?

*Scolia dubia* Say, 1837. Boston Jour. Nat. Hist. 1: 364.

*Scolia aulica* Burmeister, 1853. Naturf. Gesell. Halle, Abhandl. 1 (4): 33. ♀, ♂.

*Discolia thalia* Banks, 1912. Canad. Ent. 44: 199. ♂.

Taxonomy: Bradley, 1966. In Bradley and Betrem, Beitr. z. Ent. 16: 74 (lectotype *aulica*).

Biology: Rau and Rau, 1918. Wasp Studies Afield, pp. 129-133. —Rau, 1932. Brooklyn Ent. Soc., Bul. 27: 59-62.

**dubia haematodes** Burmeister. Tex., N. Mex., Ariz., Calif.

*Scolia haematodes* Burmeister, 1853. Naturf. Gesell. Halle, Abhandl. 1 (4): 33. ♀, ♂.

*Elis Americana* Saussure, 1857. Rev. Mag. Zool. (2) 9: 282. ♂.

Taxonomy: Bradley, 1966. In Bradley and Betrem, Beitr. z. Ent. 16: 76 (lectotype *haematodes*).

**guttata** Burmeister. Tex.; Mexico.

*Scolia guttata* Burmeister, 1853. Naturf. Gesell. Halle, Abhandl. 1 (4): 36. ♀.

*Discolia Hecate* Kirby, 1889. Ent. Soc. London, Trans., p. 449. ♂.

Taxonomy: Bradley, 1966. In Bradley and Betrem, Beitr. z. Ent. 16: 76 (lectotype *guttata*).

**mexicana** Saussure. West. Tex., N. Mex., Ariz.; Mexico. Host: *Cotinis texana* Casey.

*Scolia (Lacosi) mexicana* Saussure, 1858. Soc. Ent. France, Ann. (3) 6: 219. ♀.

*Scolia monticola* Cameron, 1893. Biol. Cent.-Amer., Hym., v. 2, p. 223. ♀, ♂.

*Scolia nigrescens* Bartlett, 1912. Ent. Soc. Amer., Ann. 5: 331.

Taxonomy: Bradley, 1964. In Betrem and Bradley, Zool. Meded. 40: 96 (synonymy).

**nobilitata nobilitata** Fabricius. U. and L. Austr. Zones, Mass. to Fla., west to Colo. and Tex.

*Scolia nobilitata* Fabricius, 1805. Systema Piezatorum, p. 244.

*Scolia tricolor* Klug, 1805. In Weber and Mohr., Beitr. z. Naturk. 1: 35.

*Scolia maculata* Guerin, 1838. In Duperrey, Voy. Coquille, Zool., v. 2, p. 255. ♀. Preocc.

*Scolia ornata* Smith, 1855. Cat. Hym. Brit. Mus., v. 3, p. 96. N. name.

**nobilitata otomita** Saussure. Calif., Nev., Ariz.; Mexico. Host: Scarabaeid larvae in debris of wood-rat nest.

*Scolia otomita* Saussure, 1858. Soc. Ent. France, Ann. (3) 6: 223. ♂.

*Scolia fulviventris* Bartlett, 1912. Ent. Soc. Amer., Ann. 5: 323. ♀.

Taxonomy: Bradley, 1964. In Betrem and Bradley, Zool. Meded. 40: 96 (subspecific status).

Biology: Ryckman, 1956. Pan-Pacific Ent. 32: 180 (host record).

**nobilitata tricincta** Say. West. Kans. and Tex., Colo., N. Mex., Ariz.

*Scolia tricincta* Say, 1823. West. Quart. Rptr. 2: 74. ? ♂.

*Scolia Ridingsii* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 445. ♀.

*Scolia inconstans* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 446. ♂.

*Scolia (Discolia) Lecontei* Cresson, 1868. Amer. Ent. Soc., Trans. 1: 376. ♀.

*Scolia (Discolia) flavocostalis* Cresson, 1868. Amer. Ent. Soc., Trans. 1: 377. ♂.

*Scolia Lewisii* (!) Cresson, 1868. Amer. Ent. Soc., Trans. 1: 377. Lapsus for *lecontei*.

*Scolia flavicostalis* (!) Banks, 1912. Canad. Ent. 44: 200.

## UNPLACED TAXON OF SCOLIA SUBGENUS DISCOLIA SAUSSURE

**bifasciata** (Swederus), N. Y.

*Sphex* (*Scolia*) *bifasciata* Swederus, 1787. Svensk. Vetensk.-Akad., Handl. 8: 281. This is possibly the same as typical *nobilitata* (F.).

## Genus TRISCOLIA Saussure

*Scolia* subg. *Triscolia* Saussure, 1863. Soc. Ent. France, Ann. (4) 3: 17.

Type-species: *Scolia* (*Triscolia*) *badia* Saussure. Monotypic.

Taxonomy: Betrem and Bradley, 1964. Zool. Meded. 39: 436-437 (description).

**ardens** (Smith). Tex., N. Mex., Ariz., Calif., ?Oreg., south into Mexico.

*Scolia fervida* Burmeister, 1853. Naturf. Gesell. Halle, Abhandl. 1 (4): 20. ♀, ♂. Preocc.

*Scolia ardens* Smith, 1855. Cat. Hym. Brit. Mus., v. 3, p. 112. N. name.

*Scolia Montezumae* Saussure, 1857. Rev. Mag. Zool. (2) 9: 281. ♀.

Taxonomy: Bradley, 1966. In Bradley and Betrem, 1966, Beitr. z. Ent. 16: 75-76 (lectotype *fervida*).

## Family SAPYGIDAE

All of the known records confirm that members of this family are parasitic in the nests of other aculeate Hymenoptera. The sapygid egg is apparently inserted through the cell closure in the host nest and usually hatches before the host egg. The newly hatched larvae of *Sapyga centrata* Say, *S. louisii* Krombein and *S. pumila* Cresson destroy the host egg and then develop on the pollen stored by the host bee; the larvae of *S. confluenta* Cresson and of *Eusapyga rubripes proxima* (Cresson) feed on the host larva after the latter has spun its cocoon. Development to the adult stage appears to be concurrent with that of the host. Sapygids parasitic on vernal bees transform to adults late in the summer, as do the host bees, and overwinter in the cocoons, emerging in the spring.

Revision: Pate, 1947. Acta Zool. Lilloana (Tucuman) 4: 396-402.

Taxonomy: Pate, 1946. Ent. News 57: 219-221 (list of type-species). —Tobias, 1965. Zool. Zhur. (Moscow) 44: 706-715, 4 figs. (family classification).

## SUBFAMILY FEDTSCHENKIINAE

This subfamily includes only the primitive fossorial genus *Fedtschenkia* Sauss. It has a disjunct distribution in xeric Holarctic areas, the five described species being known from Turkmenia, Uzbekistan, Tadzhikistan, Iran, Lebanon, Israel and western United States. Modern European workers have considered that *Fedtschenkia* constitutes a separate family based on the erroneous assumption that it is a free-living fossorial form, probably parasitic on soil-dwelling larvae as in the Scolidae. The single North American species of *Fedtschenkia* is a parasite of the ground-nesting eumenid wasp, *Pterochilus trichogaster* Bohart.

## Genus FEDTSCHENKIA Saussure

*Fedtschenkia* Saussure, 1880. In Fedtschenko, Reise in Turkestan, II, Zool. Th., 13

Hymenoptera: Scolidae, p. 13.

Type-species: *Fedtschenkia grossa* Saussure. Monotypic.

*Cosilella* Banks, 1913. Amer. Mus. Nat. Hist., Bul. 32: 237.

Type-species: *Cosila plutonis* Banks. Orig. desig.

Taxonomy: Bradley, 1955. Ent. News 66: 230-233.

**anthracina** (Ashmead). Wash., Calif., Colo., N. Mex. Ecology: Visits flowers of *Chaenactis*, *Chorizanthe*, *Cryptantha*, *Eriogonum*, *Eriophyllum*, *Melilotus* and *Wislizenia*. Host: *Pterochilus trichogaster* Bohart in soil.

*Telephoromyia anthracina* Ashmead, 1898. Psyche 8: 251. ♂.

*Plesia* (*Myzine*) *nigropilosella* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 237. ♀.

*Cosila plutonis* Banks, 1913. Amer. Mus. Nat. Hist., Bul. 32: 237. ♀.

Biology: Bohart and Schuster, 1972. Pan-Pacific Ent. 48: 149 (host record).

## SUBFAMILY SAPYGINAE

North American species have been reared only from megachilid bees. However, extralimital species have been reared from *Odynerus* sens. lat., *Anthophora* and *Xylocopa* as well as from Megachilidae.

## Genus SAPYGA Latreille

- Sapyga* Latreille, 1796. *Precis Caract. Ins.*, p. 134.  
Type-species: *Scolia quinquepunctata* Fabricius. Desig. by Latreille, 1802.
- Hellus* Fabricius, 1805. *Systema Piezatorum*, p. xiii.  
Type-species: *Sapyga sexpunctata* (Fabricius). Desig. by Shuckard, 1837.
- aculeata** Cresson. Minn., Wyo., Colo., Alta, Oreg., Calif. in Transit. Zone. Host: *Hoplitis producta* (Cr.), *H. producta gracilis* (Mich.), *H. fulgida platynura* (Ckll.), *H. hypocrita* (Ckll.), *H. sambuci* Titus. Parasite: *Sphaerophthalma amphion* (Fox).  
*Sapyga aculeata* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 450. ♀.  
*Eusapyga aciculata* (!) Hicks, 1934. Univ. Colo. Studies 21: 268.
- Biology: Davidson, 1896. Ent. News 7: 218. — Hicks, 1934. Univ. Colo., Studies 21: 268.  
— Linsley and Michener, 1942. Pan-Pacific Ent. 18: 28. — Linsley, 1944. Brooklyn Ent. Soc., Bul. 39: 54. — Parker and Bohart, 1966. Pan-Pacific Ent. 42: 96-97. — Parker and Bohart, 1968. Pan-Pacific Ent. 44: 5.
- angustata** Cresson. Wyo., Colo., Utah, Ariz., Nev., Wash., Oreg., Calif. in Transit. and U. and L. Sonor. Zones. Host: *Osmia atrocyanea* Ckll., *O. pikei* Ckll., *O. lignaria* Say., *Megachile angelarum* Ckll.  
*Sapyga angustata* Cresson, 1880. Amer. Ent. Soc., Trans. 8: Proc., p. xxi. ♂.  
*Sapyga moesta* Cresson, 1880. Amer. Ent. Soc., Trans. 8: Proc., p. xx. ♂.  
*Sapyga obscura* Cresson, 1880. Amer. Ent. Soc., Trans. 8: Proc., p. xxi. ♀.  
*Sapyga fulvicornis* Cresson, 1880. Amer. Ent. Soc., Trans. 8: Proc., p. xxi. ♂.  
*Sapyga moesta* (!) Dalla Torre, 1897. Cat. Hym., v. 8, p. 192.  
*Sapyga russellensis* Roberts, 1929. Psyche 36: 360. ♀.
- Biology: Linsley and Michener, 1942. Pan-Pacific Ent. 18: 28. — Linsley, 1944. Brooklyn Ent. Soc., Bul. 39: 54. — Parker and Bohart, 1966. Pan-Pacific Ent. 42: 97.
- centrata** Say. Ont. south to S. C., W. Va., Ill., Tex. Host: *Osmia bucephala* Cr., *O. pumila* Cr., *Hoplitis truncata* (Cr.)?  
*Sapyga centrata* Say, 1836. Boston Jour. Nat. Hist. 1: 301.  
*Sapyga americana* Cresson, 1880. Amer. Ent. Soc., Trans. 8: Proc., p. xx. ♀.  
*Sapyga pelopaei* Ashmead, 1896. Amer. Ent. Soc., Trans. 23: 179. ♂.
- Biology: Krombein, 1952. Ent. Soc. Wash., Proc. 54: 175. — Krombein, 1967. Trap-nesting wasps and bees, pp. 479-481 (life History). — Medler, 1967. Ent. Soc. Amer., Ann. 60: 342 (host record).
- confluenta** Cresson. N. H., Colo. Host: *Osmia hesperella* Ckll., *O. lignaria propinqua* Cr., *O. cordata* Robt.  
*Sapyga confluenta* Cresson, 1880. Amer. Ent. Soc., Trans. 8: Proc., p. xx. ♂.  
*Sapyga emarginata* Cresson, 1880. Amer. Ent. Soc., Trans. 8: Proc., p. xx. ♀.
- Biology: Hicks, 1934. Univ. Colo., Studies 21: 267-268.
- elegans** Cresson. Colo., Nev., Idaho, Calif., Oreg., U. Sonor. and Transit. Zones. Ecology: Visits flowers of *Arctostaphylos nevadensis*.  
*Sapyga elegans* Cresson, 1880. Amer. Ent. Soc., Trans. 8: Proc., p. xxi. ♂, ♀.  
*Sapyga coloradensis* Cresson, 1880. Amer. Ent. Soc., Trans. 8: Proc., p. xxi. ♂.  
*Sapyga truncata* Cresson, 1880. Amer. Ent. Soc., Trans. 8: Proc., p. xxi. ♂.
- Biology: Linsley and Michener, 1942. Pan-Pacific Ent. 18: 28.
- interrupta** Roberts. Colo.  
*Sapyga interrupta* Roberts, 1929. Psyche 36: 359. ♀.
- louisii** Krombein. N. Y., N. J., Fla., Mich., Tex. Host: *Heriades carinata* Cr.  
*Sapyga louisii* Krombein, 1938. Ent. Soc. Amer., Ann. 31: 467. ♂, ♀.
- Biology: Matthews, 1965. Amer. Ent. Inst., Contrib. 1, no. 3: 24-26 (life history).

*maculata* Provancher. Que.

*Sapyga maculata* Provancher, 1882. Nat. Canad. 13: 9. ♀.

*martinii* Smith. Canada, N. H., Colo., Utah, Wyo., Wash.

*Sapyga martinii* Smith, 1855. Cat. Hym. Brit. Mus., v. 3, p. 117. ♂, ♀.

*nevadica* Cresson. Tex., Utah, Nev., Idaho, Wash., Oreg., Calif. Host: *Dianthidium dubium dilectum* Timb.

*Sapyga nevadica* Cresson, 1880. Amer. Ent. Soc., Trans. 8: Proc., p. xxi. ♂.

*Sapyga montana* Cresson, 1880. Amer. Ent. Soc., Trans. 8: Proc., p. xxi. ♀.

Biology: Hurd and Linsley, 1950. N. Y. Ent. Soc., Jour. 58: 247.

*pumila* Cresson. Nebr., Colo., N. Mex., Utah, Nev., Alta., Calif. Host: *Ashmeadiella aridula* Ckll., *A. meliloti* Ckll., *Anthocopa copelandica* (Ckll.), *Dianthidium consimile* (Ashm.), *Megachile rotundata* (F.), *Osmia* sp., *Heriades variolosa* (Cr.).

*Sapyga pumila* Cresson, 1880. Amer. Ent. Soc., Trans. 8: Proc., p. xx. ♀.

*Sapyga minor* Roberts, 1933. Kans. Ent. Soc., Jour. 6: 96. ♂.

Biology: Hicks, 1934. Univ. Colo., Studies 21: 268. — Linsley, 1944. Brooklyn Ent. Soc., Bul.

39: 54. — Parker and Bohart, 1966. Pan-Pacific Ent. 42: 96-97. — Parker and Bohart, 1968.

Pan-Pacific Ent. 44: 3-4. — Torchio, 1972. Melanderia 10: 1-30, 60 figs. (life history, control).

— Parker, 1975. Pan-Pacific Ent. 51: 119 (host).

Morphology: Torchio, 1972. Melanderia 10: 8-10, figs. 26-55 (larval instars, pupa).

### Genus EUSAPYGA Cresson

*Eusapyga* Cresson, 1880. Amer. Ent. Soc., Trans. 8: Proc., p. xx.

Type-species: *Sapyga rubripes* Cresson. Desig. by Ashmead, 1903.

Host records include only the megachilid genus *Dianthidium*.

*californica* (Cresson). Calif.

*Sapyga californica* Cresson, 1880. Amer. Ent. Soc., Trans. 8: Proc., p. xx. ♂.

*intermedia* Roberts. Calif. Host: *Dianthidium* sp.

*Eusapyga intermedia* Roberts, 1929. Psyche 36: 361. ♀.

*nigripes* (Cresson). Nev.

*Sapyga nigripes* Cresson, 1880. Amer. Ent. Soc., Trans. 8: Proc., p. xx. ♂.

*rubripes carolina* Banks. N. C.

*Eusapyga carolina* Banks, 1912. Canad. Ent. 44: 203. ♂.

*rubripes proxima* (Cresson). Colo., Wyo., Mont. Host: *Dianthidium pudicum* (Cr.), probably subsp. *decorum* Timb.

*Sapyga proxima* Cresson, 1880. Amer. Ent. Soc., Trans. 8: Proc., p. xx. ♂.

Biology: Hicks, 1927. Psyche 34: 193.

*rubripes rubripes* (Cresson). Tex., Colo. Host: *Dianthidium pudicum* (Cr.), probably subsp. *decorum* Timb.

*Sapyga rubripes* Cresson, 1880. Amer. Ent. Soc., Trans. 8: Proc., p. xx. ♂, ♀.

Biology: Hicks, 1934. Univ. Colo., Studies 21: 268.

*verticalis* (Cresson). Nev., Calif. in Transit. Zone. Host: *Dianthidium consimile* (Ashm.), *D. u. ulkei* (Cr.).

*Sapyga verticalis* Cresson, 1880. Amer. Ent. Soc., Trans. 8: Proc., p. xx. ♀.

Biology: Hicks, 1934. Univ. Colo., Studies 21: 268. — Parker and Bohart, 1966. Pan-Pacific Ent. 42: 96.



## Superfamily FORMICOIDEA

By DAVID R. SMITH

### Family FORMICIDAE

Ants are social insects that live in colonies in various ecological situations, most commonly in the soil, rotting wood, and plant cavities. They are practically ubiquitous being extremely prolific in numbers of individuals even though relatively low in numbers of species. Although most ants are free-living, some are parasites on other species of ants or live asinquilines in the nests of other ants. Most ants are omnivorous, but many have a more highly specialized food requirement. A number of forms are of concern to man because of their feeding, nesting, or stinging habits. The species that nest in or near houses or other buildings are sometimes considerably annoying to man. Because of the adaptive ability of many species and their habits of nesting in plants and soil, many forms have been spread throughout the world by commerce. A number of these tramp species are found in North America.

A colony of ants is usually composed of one or more reproductive females (queens) and workers. At certain times of the year a nest also contains males and virgin females. There are three distinct castes of ants, the female, males, and workers. The female is winged but loses her wings soon after finding a suitable place to begin a new colony; her main purpose is reproduction. The male is winged and is short-lived; he dies soon after mating. The workers are not winged, and their main functions are to build the nest, feed the colony, care for the young, and defend the nest. In some cases, workers are also reproductive forms. Many ants are monomorphic, that is, the workers are all the same size. Other ants are polymorphic, in which case the workers vary considerably in size. In polymorphic species, the largest workers are commonly termed soldiers or maxims and the smaller workers termed minors or minims. The size of a colony of ants, depending on the species and age of the colony, varies and may contain only a few dozen to many thousands of individuals.

The literature on ants is voluminous. It is impossible to cite every reference on the subject. The following list contains some of the more significant works on a variety of subjects. Further references may be found in the literature cited sections of these citations. There have been many local or state faunal lists and treatments of ants; many of these are given by Smith (1947) who listed 84 publications by states. They are not repeated here.

I appreciate the cooperation of the following myrmecologists who have reviewed all or parts of this section: A. C. Cole, University of Tennessee, Knoxville; A. Francoeur, Université du Québec à Chicoutimi; M. R. Smith, Arlington, Virginia; R. R. Snelling, Los Angeles County Museum, California; and J. F. Watkins II, Baylor University, Waco, Texas. This section is based in large part on the Formicidae sections of the first Hymenoptera Catalog (1951) and its supplements (1958, 1967) by M. R. Smith.

Revision: Creighton, 1950. Harvard Univ., Mus. Comp. Zool., Bul. 104: 1-585, 57 pls. (keys to genera and species of N. Amer.).

- Taxonomy: Dalla Torre, 1893. Cat. Hym., v. 7, 289 pp. (world cat.). — Emery, 1910. *In* Wytsman, Gen. Ins., fasc. 102, 34 pp. (Dorylinae, world cat.). — Emery, 1911. *In* Wytsman, Gen. Ins., fasc. 118, 124 pp. (Ponerinae, world cat.). — Wheeler, 1911. N. Y. Acad. Sci., Ann. 21: 157-175 (type-species). — Emery, 1912. *In* Wytsman, Gen. Ins., fasc. 137, 50 pp. (Dolichoderinae, world cat.). — Wheeler, 1920. Psyche 27: 46-55 (subfamilies). — Emery, 1921. *In* Wytsman, Gen. Ins., fasc. 174, 379 pp. (Myrmicinae, world cat.). — Wheeler, 1922. Amer. Mus. Nat. Hist., Bul. 45: 631-710 (keys to world genera and subgenera). — Emery, 1925. *In* Wytsman, Gen. Ins., fasc. 183, 302 pp. (Formicinae, world cat.). — Carpenter, 1930. Harvard Univ., Mus. Comp. Zool., Bul. 70: 1-66 (fossil ants of N. Amer.). — Donisthorpe, 1943. Ann. and Mag. Nat. Hist. (11) 10: 617-648, 649-688, 721-737 (type-species). — Smith, 1943. Amer. Midland Nat. 30: 273-321 (key to N. Amer. genera based on males). — Smith, 1947. Amer. Midland Nat. 37: 521-647 (key to N. Amer. genera based on workers; list of publications on ants by states). — Van Pelt, 1948. Fla. Ent. 30: 57-67 (spp. of Alachua Co., Fla.). — Brown, 1954. Insectes Sociaux 1: 21-31 (phylogeny and subfamily classification). — Van Pelt, 1956. Amer. Midland Nat. 56: 358-387 (spp. of Welaka Reserve, Fla.). — Kannoński, 1956. Amer. Midland Nat. 56: 168-185 (spp. of Ramsey Co., N. Dak.). — Van Pelt, 1958. Amer. Midland Nat. 59: 1-57 (list of spp. of Welaka Reserve, Fla.). — Wenner, 1959. Amer. Midland Nat. 62: 174-182 (spp. of Bidwell Park, Chico, Calif.). — Wheeler and Wheeler, 1960. Psyche 67: 87-94 (techniques for study of larvae). — Carter, 1962. Elisha Mitchell Sci. Soc., Jour. 78: 150-204 (N. C.). — Carter, 1962. Elisha Mitchell Sci. Soc., Jour. 78: 1-18 (N. C. Piedmont). — Wheeler and Wheeler, 1963. Ants of N. Dak., Univ. N. Dak. Press, Grand Forks, 326 pp. — Gregg, 1963. Ants of Colo., Univ. Colo. Press, Boulder, 792 pp. — Wilson, 1964. Breviora 210: 1-14 (ants of Fla. Keys). — Young and Howell, 1964. Okla. Agr. Expt. Sta. MP 71 (spp. of Okla.). — Cole, 1966. Brigham Young Univ., Sci. Bul., Biol. Ser. 7 (3): 1-27 (spp. of Nev. Test Site). — Wilson and Taylor, 1967. Pacific Ins. Monog. 14: 1-109 (spp. of Polynesia). — Wilson, Carpenter, and Brown, 1967. Psyche 74: 1-19 (first Mesozoic ant; a new subfamily). — Warren and Rouse, 1969. Ark. Univ., Agr. Expt. Sta., Div. Agr. Bul. 742, 67 pp. (spp. of Ark.). — Ross, Rotramel, and LaBerge, 1971. Ill. Nat. Hist. Survey, Biol. Notes No. 71, 22 pp. (common and economic ants of Ill.). — Wheeler and Wheeler, 1972. Ent. Soc. Wash., Proc. 74: 35-45 (subfamilies). — Kempf, 1972. Studia Ent. 15: 3-344 (cat. of Neotropical ants). — Wheeler and Wheeler, 1973. Ants of Deep Canyon, Philip L. Boyd Deep Canyon Research Center, Univ. Calif., Riverside, 159 pp. — Brown, 1973. *In* Meggers, *et al.*, Tropical forest ecosystems in Africa and S. Amer., Smithson. Inst. Press, Wash., D. C., pp. 161-185 (list of world generic and subgeneric names; suggested synonymy). — Wheeler and Wheeler, 1976. Ent. Soc. Wash., Mem. 7, 108 pp. (ant larvae: review and synthesis).
- Biology: McCook, 1882. The honey ants of the Garden of the Gods, and the occident ants of the American plains, Philadelphia, 188 pp. — Buckingham, 1911. Amer. Acad. Arts and Sci., Proc. 46: 425-507 (division of labor). — Wheeler, 1910. Ants, their structure, development, and behavior, Columbia Univ. Press, N. Y., 663 pp. (reprinted 1926, 1960). — Wheeler, 1928. The social insects, their origin and evolution, Harcourt, Brace and Co., N. Y., 378 pp. — Forel, 1928. The social world of the ants, G. P. Putnam's Sons, Ltd., London and N. Y., v. 1, 551 pp., v. II, 445 pp. — Jones, 1929. Colo. Agr. Col., Expt. Sta. Bul. 341, 96 pp. (relation to aphids). — Wheeler, 1936. Amer. Acad. Arts and Sci., Proc. 71: 159-243 (ecological relations to termites). — Haskins and Enzmann, 1938. N. Y. Acad. Sci., Ann. 37: 97-162 (sociological and physiological features). — Haskins, 1939. Of ants and men, Prentice-Hall Inc., N. Y., 244 pp. — Lafleur, 1941. N. Y. Ent. Soc., Jour. 49: 227-231 (civil disturbances in ant communities). — Lafleur, 1941. N. Y. Ent. Soc., Jour. 49: 199-204 (communal disaffection). — Lafleur, 1942. Sci. Monthly 65: 467-471 (behavior in the face of obstacles). — Smith and Weiss, 1942. U. S. Dept. Agr., Tech. Bul. 798, 44 pp. (relation to azalea flower spot). — Wheeler, 1942. Harvard Univ., Mus. Comp. Zool., Bul. 40: 1-252 (Neotropical ant-plants and their ants). — MacGregor, 1948. Behaviour 1: 267-296 (odor as a basis for orientated movement). — Brackbill, 1948. Auk 65: 66-77 (anting by birds). — Nixon, 1951. The association of ants with aphids and coccids, Commonwealth Inst. Ent. (London), 35 pp. — Valentini, 1951. Ann. Sci. Nat. (Zool.) 11: 249-276 (adaptation of larvae). — Flanders, 1951. Canad. Ent. 83: 93-98 (role of ants in biological control of homopterous insects). — Flanders, 1952. Jour. Econ. Ent. 45: 38-39 (ovisorption as the mechanism



- causing worker development). —Flanders, 1953. *Sci. Monthly* 76: 142-148 (caste determination). —Talbot, 1953. *Mich. Univ., Contrib. Lab. Vertebrate Biol.* 63, 13 pp. (fauna and populations). —Wilson, 1953. *Psyche* 60: 15-20 (caste determination). —Simeone, 1954. *State Univ. N. Y., Syracuse, Col. Forestry Bul.* 34, 19 pp. (carpenter ants and their control). —Chapman, 1954. *Pan-Pacific Ent.* 30: 93-102 (swarming of ants on mountain summits). —Gosswald, 1955. *Rev. Suisse de Zool.* 62: 372-386 (caste determination). —O'Rourke, 1956. *Insectes Sociaux* 3: 107-118 (medical and veterinary importance). —Wilson and Eisner, 1957. *Insectes Sociaux* 4: 157-166 (liquid transmission of food). —Talbot, 1957. *Insectes Sociaux* 4: 375-384 (populations). —Brian, 1957. *Ann. Rev. Ent.* 2: 107-120 (caste determination). —Weber, 1958 (1956). *Tenth Internat. Cong. Ent., Proc.* 2: 459-473 (evolution of ants and feeding habits). —Eisner and Wilson, 1958 (1956). *Tenth Internat. Cong. Ent., Proc.* 2: 509-513 (food transmission). —Kannowski, 1959. *Insectes Sociaux* 6: 115-162 (flight activities and colony founding of bog ants in Mich.). —Wilson, 1959. *Anat. Rec.* 134: 653 (pheromones in organization of ant societies). —Bartlett, 1961. *Ent. Soc. Amer., Ann.* 54: 543-551 (influence of ants on parasites, predators, and scale insects). —Downey, 1962. *Ent. News* 73: 57-66 (association with larvae of a lycaenid butterfly). —Ayre, 1962. *N. Y. Ent. Soc., Jour.* 70: 159-167 (use of Lincoln Index for estimating size of colonies). —Reid, 1962. *Ga. Agr. Expt. Sta. and Univ. Ga. Handbook*, 71 pp. (as intermediate hosts of chicken and turkey tapeworms). —Van Pelt, 1963. *Amer. Midland Nat.* 69: 205-223 (distribution in south. Blue Ridge Mtns.). —Way, 1963. *Ann. Rev. Ent.* 8: 307-344 (mutualism between ants and honeydew producing Homoptera). —Kincaid, 1963. *Amer. Micros. Soc., Trans.* 82: 101-105 (pollination of plants). —Wilson, 1963. *Ann. Rev. Ent.* 8: 345-368 (social biology). —Wilson, 1963. *Evolution* 17: 249-253 (social modification). —Ayre, 1963. *Canad. Ent.* 95: 712-715 (feeding habits). —Wilson and Bossert, 1963. *Recent Progress* 19: 673-716 (chemical communication). —Orlog, 1964 (1963). *Ent. Expt. and Appl.* 6: 95-106 (plant virus transmission). —Talbot, 1965. *Insectes Sociaux* 12: 19-47 (populations in a low field). —Brian, 1965. *Social insect populations*, Academic Press, London and N. Y., 135 pp. —Smith, 1965. *U. S. Dept. Agr., Tech. Bul.* 1326, 105 pp. (house-infesting ants of east. U. S.). —Janzen, 1966. *Evolution* 20: 249-275 (coevolution of mutualism between ants and acacias). —Beck, Allred, and Despain, 1967. *Great Basin Nat.* 27: 67-78 (predaceous-scorpion ants in Utah). —Sudd, 1967. *An introduction to the behavior of ants*, St. Martin's Press, N. Y., 200 pp. —Markin, 1968. *Jour. Econ. Ent.* 61: 1744-1745 (handling techniques for large quantities of ants). —Wilson, 1971. *The insect societies*, Belknap Press of Harvard Univ., 548 pp. —Lettendre, *et al.*, 1971. *Nat. Canad.* 98: 591-606 (spp. from St. Hippolyte, Que.). —Payne and Mason, 1971. *Ent. Soc. Wash., Proc.* 73: 135-136, 138 (ants associated with pig carrion). —Jennings, 1971. *Ent. Soc. Amer., Ann.* 64: 384 (ants preying on jack-pine budworm larvae). —Finnegan, 1971. *Canad. Ent.* 103: 1489-1493 (indigenous ants as limiting agents of forest pests in Que.). —Bhatkar and Whitcomb, 1970. *Fla. Ent.* 53: 229-232 (artificial diet for rearing various spp.). —Nielsson, *et al.*, 1971. *Fla. Ent.* 54: 245-248 (ants associated with aphids in Fla.). —Whitcomb, *et al.*, 1972. *Fla. Ent.* 55: 129-142 (ants of Fla. soybean fields). —Gregg, 1972. *Canad. Ent.* 104: 1073-1091 (northward distribution of ants in N. Amer.). —Hickman, 1974. *Science* 184: 1290-1292 (pollination by ants: a low-energy system). —Lettendre and Pilon, 1973. *Nat. Canad.* 100: 195-235 (ant fauna of Laurentide, Que.). —Finnegan, 1974. *Entomophaga* 7: 53-59 (ants as predators of forest pests). —Gurney, 1975. *Insect World Digest* 2 (5): 19-25 (stinging ants).
- Morphology:** Reid, 1941. *Roy. Ent. Soc. London, Trans.* 91: 367-446 (thorax of wingless and short-winged Hymenoptera). —Brown and Nutting, 1950. *Amer. Ent. Soc., Trans.* 75: 113-132 (wing venation). —Wilson, 1953. *Quart. rev. Biol.* 28: 136-156 (polymorphism). —Wilson, 1954. *Insectes Sociaux* 1: 75-80 (polymorphism). —Eisner, 1957. *Harvard Univ., Mus. Comp. Zool., Bul.* 116: 439-490 (studies of the proventriculus). —Glockner, 1957. *Insectes Sociaux* 4: 83-90 (effect of hormones on metamorphosis). —Eisner and Brown, 1958 (1956). *Tenth Internat. Cong. Ent., Proc.* 2: 503-508 (evolution and social significance of the proventriculus). —Nachtweg, 1961. *Insectes Sociaux* 8: 369-381. —Tulloch, Shapiro, and Hershenov, 1962. *Brooklyn Ent. Soc., Bul.* 77: 91-101 (ultrastructure of metasternal glands). —Roth and Eisner, 1962. *Ann. Rev. Ent.* 7: 107-136 (chemical defenses). —Wilson, 1963. *Sci. Amer.* 208: 100-106 (pheromones). —Nachtweg, 1963. *Insectes Sociaux* 10: 43-57

(sound organs). —Nachtweg, 1964 (1963) *Insectes Sociaux* 10: 359-378 (acoustics). —Etterschank and Brown, 1964. *Ent. Monthly Mag.* 100: 5-7 (Malpighian tubules as meristic characters). —Williams and Williams, 1964. *Soc. Expt. Biol.* 116: 161-163 (toxicity studies of ant venom). —Cavil and Robertson, 1965. *Science* 149: 1337-1345 (ant venoms, attractants and repellants). —Law, Wilson, and McCloskey, 1965. *Science* 149: 544-546 (biochemical polymorphism). —Brown, 1968. *Amer. Nat.* 102: 188-191 (function of metapleural glands). —Gotwald, 1969. *Cornell Univ., Agr. Expt. Sta. Mem.* 408, 150 pp. (mouthparts). —Hermann, 1969. *Ga. Ent. Soc., Jour.* 4: 123-141 (poison apparatus). —Blum, 1969. *Ann. Rev. Ent.* 14: 57-80 (alarm pheromones).

## SUBFAMILY DORYLINAE

Members of this subfamily are known as army ants and are sometimes referred to as legionary ants in the New World and driver ants in the Old World. They are predaceous and are known for their foraging expeditions the size of which are sometimes exaggerated. Army ants exhibit a number of morphological and biological peculiarities not common to most ants such as wasplike males, wingless termitelike females, blind workers, and their raiding and emigrating behavior. Rettenmeyer (1963) outlined the following traits in which they differ from other ants: (1) They feed almost exclusively on animal prey which is collected by large groups of raiding workers; (2) their raiding columns usually connect to the nest by at least one continuous column; (3) the entire colony periodically and frequently emigrates to new nest sites; (4) emigrations are largely dependent on the size, caste, age, and range of ages of the brood (or broods); and (5) the colonies are founded by division of an entire colony into two (or possibly several) daughter colonies. Other ants may possess some of these traits, but not all of them.

Much of the biological work on army ants has been done in Central America on the terrestrial species of *Eciton* which bivouac in large clusters above the ground and whose colonies may number up to a million individuals. Most of the army ants, however, are subterranean in habit, though the raiding columns of some may appear above ground. Raiding may be in columns only several ants wide or in swarms of a fan-shaped pattern. Most of the prey is other Arthropods, only occasionally vertebrates. All species have nomadic and statary activity cycles where the entire colony moves from one area to another, a unique behavior studied by Schneirla and Rettenmeyer in the papers listed below.

Borgmeier's revision of 1955 is the most definitive taxonomic work on this subfamily for the New World. He recognized 137 species in 5 genera and 2 tribes. Only the tribe Ecitonini is found in the United States; the other tribe, Cheliomyrmecini, includes a single genus of several species found from Mexico to Brazil. In the United States, most species are found in the Southwest, though several reach the Atlantic coast and range north to Iowa, Ohio, and Virginia. Most of the taxonomy is based on males and workers, and for some species only one caste is known. Further study and association of castes may result in some synonymy, especially in *Neivamyrmex*.

Revision: Smith, 1942. *Amer. Midland Nat.* 27: 537-590 (U. S.). —Borgmeier, 1955. *Studia Ent.* 3: 1-716 (New World). —Watkins, 1976. *The identification and distribution of New World army ants*, Baylor Univ. Press 102 pp. (keys to genera and spp. of workers and males; distribution maps).

Taxonomy: Wheeler, 1943. *Ent. Soc. Amer., Ann.* 36: 319-332 (larvae). —Borgmeier, 1953. *Studia Ent.* 2: 1-51. —Borgmeier, 1958. *Studia Ent.* 1(n. s.): 197-208 (Ecitonini; identification of females to genus). —Wheeler and Wheeler, 1964. *Ent. Soc. Wash., Proc.* 66: 129-137 (larvae). —Watkins 1972. *Kans. Ent. Soc., Jour.* 45: 347-372 (U. S. *Neivamyrmex*).

Biology: Wheeler, 1900. *Amer. Nat.* 34: 563-574. —Wheeler, 1910. *Ants*, pp. 246-266. —Schneirla, 1933. *Jour. Comp. Psychology* 15: 267-299 (in Panama). —Schneirla, 1934. *Nat. Acad. Sci., Proc.* 20: 316-321 (raiding and other phenomena). —Schneirla, 1938. *Jour. Comp. Psychology* 25: 51-90 (theory of army ant behavior). —Schneirla, 1940. *Jour. Comp. Psychology* 29: 401-460 (mass organization in the swarm-raiders). —Schneirla, 1944. *N. Y. Ent. Soc., Jour.* 52: 153-192 (reproductive functions of queen as pace-makers of group behavior). —Schneirla 1944. *Amer. Phil. Soc. Proc.* 87: 438-457 (nomadism in *Eciton burchelli* (Westwood)). —Schneirla, 1945. *Biol. Bul.* 88: 166-193 (nomad-statary relations in swarmlers; migration). —Schneirla, 1947. *Amer. Mus. Novitates* 1336: 1-20 (life and

behavior under dry season conditions with reference to reproductive functions).

—Schneirla, 1948. *Zoologica* (N. Y.) 33: 89-112 (life and behavior under dry season conditions, appearance and date of males). —Schneirla, 1948. *Sci. Amer.* 178: 16-23 (general). —Schneirla, 1949. *Amer. Mus. Nat. Hist., Bul.* 94: 1-82 (life and behavior under dry season conditions, course of reproduction and colony behavior). —Schneirla, 1950. (Mex.) *Inst. de Biol., An.* 20: 371-384 (environmental adaptations). —Schneirla and Brown, 1950. *Amer. Mus. Nat. Hist., Bul.* 95: 269-233 (life and behavior under dry season conditions, cyclic processes in behavioral and reproductive functions). —Schneirla and Brown, 1952. *Zoologica* (N. Y.) 37: 5-32 (sexual broods and production of young queens). —Schneirla, 1953. *Insectes Sociaux* 1: 29-41 (army ant queen). —Schneirla, Brown and Brown, 1954. *Ecol. Monog.* 24: 269-296. (bivouac or temporary nest as adaptive factor in terrestrial species). —Tafari, 1955. *N. Y. Ent. Soc., Jour.* 63: 21-41 (growth and polymorphism of larva of *Eciton hamatum* (F.)). —Schneirla, 1956. *Insectes Sociaux* 3: 49-69 (colony division and related processes). —Schneirla, 1956. *Smithsn. Inst. Ann. Rpt.*, 1955 pp. 379-406 (army ants, general). —Schneirla, 1957. *Insectes Sociaux* 4: 259-298 (comparison of functional patterns in army ants). —Schneirla, 1957. *Amer. Phil. Soc., Proc.* 101: 106-133 (theoretical consideration of cyclic processes). —Schneirla, 1958. *Insectes Sociaux* 5: 215-255 (behavior and biology of *Neivamyrmex nigrescens* (Cresson) and *N. opacithorax* (Emery)). —Brown, 1960. *Psyche* 66: 25-27 (alarm and attack behavior). —Schneirla, 1960. *Smithsn. Treasury of Science*. Simon and Schuster, N. Y., pp. 664-696 (army ants, general). —Schneirla, 1961. *Ztschr. f. Tierpsychol.* 18: 1-32 (sexual broods and colony division of *Neivamyrmex nigrescens* (Cresson)). —Rettenmeyer, 1961. *Kans. Univ., Sci. Bul.* 42: 993-1066 (biology and taxonomy of flies over swarms of army ants). —Rettenmeyer, 1963. *Univ. Kans., Sci. Bul.* 44: 287-465 (behavioral studies of army ants in Canal Zone and Kansas). —Schneirla, 1963. *Animal Behavior* 11: 583-595 (springtime resurgence of cyclic function, Arizona species). —Rettenmeyer, 1960. *XI. Internat. Kong. fur Ent., Wien*, 1960, 1: 610-612 (mites associated with army ants). —Rettenmeyer, 1962. *Kans. Ent. Soc., Jour.* 35: 377-384 (millipedes associated with army ants). —Rettenmeyer, 1963. *Ent. Soc. Amer., Ann.* 56: 170-174 (*Thysanura* associated with army ants). —Watkins, 1964. *Kans. Ent. Soc., Jour.* 37: 22-28 (trail following). —Watkins and Cole, 1966. *Tex. Jour. Sci.* 18: 254-265 (attraction of workers to secretion of queens). —Akre and Rettenmeyer, 1966. *Kans. Ent. Soc., Jour.* 39: 745-782 (*Staphylinidae* associated with army ants). —Watkins, Cole, and Baldrige, 1967. *Kans. Ent. Soc., Jour.* 40: 146-151 (trail following and trail preference). —Akre and Rettenmeyer, 1968. *Kans. Ent. Soc., Jour.* 41: 165-174 (trail following by guests of army ants). —Akre, 1968. *Pan-Pacific Ent.* 44: 87-101 (*Histeridae* associated with army ants). —Rettenmeyer and Akre, 1968. *Ent. Soc. Amer., Ann.* 61: 1317-1326 (ectosymbiosis between phorid flies and army ants.). —Kannowski, 1969. *Internat. Union for study of social insects, VI Cong., Proc.* 6: 77-83 (daily and seasonal periodicities in nuptial flights). —Torgerson and Akre, 1970. *Melandria* 5: 1-28 (persistence of army ant chemical trails and their significance in *Ecitonine*-*Ecitophile* association). —Torgerson and Akre, 1970. *Kans. Ent. Soc., Jour.* 43: 395-404 (interspecific responses to trail and alarm pheromones). —Schneirla, 1971. *Army Ants: A Study in Social Organization*. W. H. Freeman, San Francisco. 349 pp. —Topoff, 1971. *Amer. Nat.* 105: 529-548 (polymorphism related to division of labor and colony cyclic behavior).

**Morphology:** Hagen, 1954. *Amer. Mus. Novitates* 1663: 1-12 (anatomy of queen of *Eciton*).

—Hagen, 1954. *Amer. Mus. Novitates* 1664: 1-17 (Reproductive system of queen of *Eciton*). —Hagen, 1954. *Amer. Mus. Novitates* 1665: 1-20 (oocyte cycle). —Lappano, 1958. *Insectes Sociaux* 5: 31-66 (morphological study of larval development in all worker broods of *Eciton burckhelli* (Westwood)). —Whelden, 1963. *N. Y. Ent. Soc., Jour.* 71: 158-178 (reproductive system of worker and female of *Eciton hamatum* (F.) and *Eciton burckhelli* (Westwood)). —Whelden, 1963. *N. Y. Ent. Soc., Jour.* 71: 246-261 (antennae and legs of *E. hamatum* and *E. burckhelli*).

## TRIBE ECITONINI

### Genus LABIDUS Jurine

*Labidus* Jurine, 1807. *Nouv. Meth. Class. Hym. Dipt.*, p. 282.

Type-species: *Labidus latreillei* Jurine. Monotypic.

*Nycteresia* Roger, 1861. Berlin. Ent. Ztschr. 5: 21.

Type-species: *Formica coeca* Latreille. Monotypic.

*Pseudodictyadina* Andre, 1885. Spec. Hym. Eur. Alg. 2: 838.

Type-species: *Pseudodictyadina incerta* Andre. Monotypic.

A neotropical genus of 8 species, one of which reaches the United States.

Revision: Borgmeier, 1955. Studia Ent. 3: 80-134.

Taxonomy: Wheeler and Wheeler, 1964. Ent. Soc. Wash., Proc. 66: 134 (larvae).

Biology: Rettenmeyer, 1963. Kans. Univ., Sci. Bul. 44: 403-424 (behavioral studies in Canal Zone).

*coecus* (Latreille). S. Ark., La., Okla., Tex. s. to Argentina. Ecology: The large colonies, usually with many thousands of individuals, are found in more or less temporary nests in decayed logs and stumps or in ground beneath objects. They are subterranean and nocturnal. Food consists of other arthropods, small mammals, birds, and nuts. Workers are highly predaceous and are known to feed on injurious insects such as the immature stages of the screwworm (*Cochliomyia hominivorax* (Coquerel)) and the secondary screwworm (*C. macellaria* (F.)).

*Formica omnivora* Olivier, 1791. Encycl. Meth. Hist. Nat. 6: 496. ♀. Preocc. by Linnaeus, 1758.

*Formica coeca* Latreille, 1802. Hist. Nat. Fourmis, v. 9, p. 270. ♀.

*Labidus latreillii* Jurine, 1807. Nouv. Meth. Class. Hym. Dipt., p. 283. ♂.

*Labidus jurini* Shuckard, 1840. Ann. Nat. Hist. 5: 198. ♂.

*Labidus servillei* Westwood, 1842. Arcana Ent., v. 1, p. 75. ♂.

*Mutilla* (*Labidus*) *fulvescens* Blanchard, 1849. In Cuvier, Regne Animale, ed. 3, v. 2, pl. 118, fig. 2.

*Labidus saji* (!) Haldeman, 1852. In Stanbury, Exped. Great Salt Lake, p. 367. ♂.

*Labidus atriceps* Smith, 1859. Cat. Hym. Brit. Mus., v. 7, p. 5. ♂.

*Labidus pilosus* Smith, 1859. Cat. Hym. Brit. Mus., v. 7, p. 7. ♂.

*Labidus panzeri* Smith, 1859. Cat. Hym. Brit. Mus., v. 7, p. 72. ♂.

*Eciton vastator* Smith, 1860. Jour. Ent., London 1: 71. ♀.

*Eciton erratica* Smith, 1860. Jour. Ent., London 1: 71. ♀.

*Myrmica rubra* Buckley, 1867. Ent. Soc. Phila., Proc. 6: 335. ♀. Preocc. in *Myrmica* by Linnaeus, 1758.

*Pseudodictyadina incerta* Andre, 1885. Spec. Hym. Eur. Alg. 2: 838. ♀.

*Eciton smithii* Dalla Torre, 1892. Cat. Hym., v. 7, p. 6. N. name for *L. pilosus* Smith.

*Eciton coecum* var. *biloba* Emery, 1901. Soc. Ent. Belg., Ann. 45: 51. ♂.

*Eciton nigrita* Emery, 1901. Soc. Ent. Belg., Ann. 45: 52. ♂.

*Eciton coecum* var. *kulowi* Forel, 1901. Mitt. Nat. Mus. Hamburg 18: 47. ♂.

*Eciton selysi* Forel, 1904. Soc. Ent. Belg., Ann. 48: 169. ♀.

*Eciton grassator* Forel, 1911. Deut. Ent. Ztschr., p. 288. ♀.

*Eciton* (*Labidus*) *coecum* var. *hostilis* Santschi, 1920. Soc. Ent. France, Ann. 88: 368. ♂.

*Eciton* (*Labidus*) *coecum* var. *opacifrons* Wheeler, 1921. Amer. Acad. Arts and Sci., Proc. 56: 310. ♀.

*Eciton* (*Labidus*) *coecum* var. *elsbethae* Forel, 1922. Rev. Suisse Zool. 30: 91. ♂.

*Eciton* (*Labidus*) *serpentis* Weber, 1938. Ent. Soc. Amer., Ann. 31: 209. ♀.

Taxonomy: Weber, 1941. Amer. Midland Nat. 26: 238 (queen). — Wheeler, 1943. Ent. Soc. Amer., Ann. 36: 332 (larva). — Wheeler and Wheeler, 1964. Ent. Soc. Wash., Proc. 66: 135 (larva).

Biology: Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24: 408-409. — Lindquist, 1942. Jour. Econ. Ent. 35: 850 (as predators of screwworms). — Hess, 1958. Field and Lab. 26: 35-37. — Kempf, 1961. Studia Ent. 4(n.s.): 551-552 (as a cave ant). — Rettenmeyer, 1963. Kans. Univ., Sci. Bul. 44: 418-424. — Smith, 1965. U. S. Dept. Agr. Tech. Bul. 1326, pp. 17-18. — Watkins and Cole, 1966. Tex. Jour. Sci. 18: 254-265 (attraction of workers to secretion of queens). — Watkins, Cole, and Baldrige, 1967. Kans. Ent. Soc., Jour. 40: 146-151 (trail following and trail preference).

Morphology: Borgmeier, 1957. Rev. Brasil. Biol. 17: 390 (maxillary and labial palps).  
—Gotwald, 1969. N. Y. Agr. Expt. Sta. (Cornell Univ.) Mem. 408, p. 127 (mouthparts).

### Genus *NOMAMYRMEX* Borgmeier

*Eciton* subg. *Nomamyrmex* Borgmeier, 1936. Inst. Biol. Veg. Arq. 3: 55.

Type-species: *Eciton crassicornis* Smith. Orig. desig.

A genus of two species, a subspecies of only one reaching the United States. They are subterranean though carrying on terrestrial raids. Raiding is in columns of several ants wide and a few meters long and is sometimes done during the daylight hours.

Revision: Borgmeier, 1955. Studia Ent. 3: 135-161.

Taxonomy: Borgmeier, 1953. Studia Ent. 2: 4. —Borgmeier, 1958. Studia Ent. 1 (n. s.): 201-203.

Biology: Rettenmeyer, 1963. Kans. Univ. Sci. Bul. 44: 424-432 (behavioral studies in Canal Zone; *esenbeckii crassicornis* (Smith)).

Morphology: Borgmeier, 1957. Rev. Brasil. Biol. 17: 390 (maxillary and labial palps).

*esenbeckii wilsoni* (Santschi). Extreme s. Tex. to Costa Rica. *N. esenbeckii esenbeckii* (Westwood) is South American. Literature references for *esenbeckii* (Westwood) and *crassicornis* (Smith) from Texas pertain to *wilsoni*.

*Eciton* (*Labidus*) *Esenbecki Wilsoi* Santschi, 1919. Soc. Ent. France, Ann. 88: 366. ♂.

*Eciton* (*Holopone*) *crassicornis mordax* Santschi, 1928. Deut. Ent. Ztschr., p. 415. ♀.

Taxonomy: Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24: 409 (male).

### Genus *NEIVAMYRMEX* Borgmeier

*Eciton* subg. *Acamatus* Emery, 1894. Soc. Ent. Ital., Bol. 26: 181. Preocc. by Schoenherr, 1833.

Type-species: *Eciton (Acamatus) schmitti* Emery. Desig. by Wheeler, 1911.

*Eciton* subg. *Neivamyrmex* Borgmeier, 1940. Rev. de Ent. 11: 606. N. name for *Acamatus* Emery.

*Woitkowskia* Enzmann, 1952. Iowa Acad. Sci., Proc. 59: 443.

Type-species: *Woitkowskia connectens* Enzmann. Orig. desig.

About 115 species are known for this New World genus, but only 23 are found north of Mexico. Most species are found in the southwestern states with a few ranging east to the Atlantic coast and as far north as Virginia, Ohio, Illinois, and Iowa. The species are hypogaeic and are found in the soil under objects, though some have been reported from rotten logs and stumps. Some may carry on their foraging and emigrating activities during daylight, but most are apparently nocturnal in their activities. Most colonies have one functional queen, and new colonies are produced by fission. The cyclic pattern of nomadic and statary phases is similar to the tropical species, but in most Nearctic species the activity stops in the autumn and resumes again in the spring. Because many of the species listed below were described from a single caste, future study and caste association may reveal that fewer species actually exist.

Revision: Smith, 1942. Amer. Midland Nat. 27: 537-590 (U. S. species). —Borgmeier, 1955. Studia Ent. 3: 277-651 (New World species).

Taxonomy: Borgmeier, 1950. Rev. de Ent. 21: 624. —Watkins, 1971. Kans. Ent. Soc., Jour. 44: 93-103 (key to major workers and queens of U. S.). —Watkins, 1972. Kans. Ent. Soc., Jour. 45: 347-372 (keys for each caste and distribution of U. S. species).

Biology: Schneirla, 1958. Insectes Sociaux 5: 215-255 (last part of functional season, s.e. Ariz.). —Schneirla, 1961. Ztschr. f. Tierpsychologie 18: 1-32 (sexual broods and colony division). —Schneirla, 1963. Animal Behaviour 11: 583-595 (spring resurgence of cyclic function, s.e. Ariz.). —Rettenmeyer, 1963. Kans. Univ., Sci. Bul. 44: 433-452 (behavioral studies). —Watkins, 1964. Kans. Ent. Soc., Jour. 37: 22-28 (trail following). —Watkins and Cole, 1966. Tex. Jour. Sci. 18: 254-265 (attraction of workers to secretions of queens). —Watkins, Cole, and Baldrige, 1967. Kans. Ent. Soc., Jour. 40: 146-151 (trail following and

trail preference). —Plsek, Kroll, and Watkins, 1969. Kans. Ent. Soc., Jour. 42: 452-456 (association with carabids).

Morphology: Borgmeier, 1957. Rev. Brasil. Biol. 17: 392-393 (maxillary and labial palps).

**agilis** Borgmeier. S. Ariz.; Mexico. Only the worker is known.

*Neivamyrmex agilis* Borgmeier, 1953. Studia Ent. 2: 45. ♀.

**andrei** (Emery). N. Mex., Ariz.; Mexico. Only the male is known.

*Eciton andrei* Emery, 1901. Soc. Ent. Ital., Bol. 33: 53. ♂.

*Eciton (Acamatus) ostarri* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24: 415. ♂.

**baylori** Watkins. Tex. (Waco).

*Neivamyrmex baylori* Watkins, 1973. Kans. Ent. Soc., Jour. 46: 430-433. ♂.

**californicus** (Mayr). Utah, Nev., Calif. Only the worker and queen are known.

*Eciton californicum* Mayr, 1870. Zool.-Bot. Gesell. Wien, Verh. 20: 969. ♀.

*Eciton (Acamatus) californicum* var. *obscura* Forel, 1914. Soc. Vaud. Sci. Nat., Bul. 50: 265. ♀.

Taxonomy: Watkins, 1972. Kans. Ent. Soc., Jour. 45: 363-366 (queen, distribution).

Biology: Mallis, 1938. Sci. Monthly 47: 220-226. —Mallis, 1941. South. Calif. Acad. Sci., Bul. 40: 62.

**carolinensis** (Emery). Va., N. C., S. C., Ga., Fla., Ohio, Tenn., Ala., Miss., La., Nebr., Kans., N. Mex., Ariz. All castes are known.

*Eciton (Acamatus) carolinense* Emery, 1894. Soc. Ent. Ital., Bol. 26: 184. ♀.

Biology: Smith, 1928. Ent. News 39: 245. —Dennis, 1938. Ent. Soc. Amer., Ann. 31: 278, 304.

—Watkins, 1964. Kans. Ent. Soc., Jour. 37: 22-28 (trail following). —Watkins and

Rettenmeyer, 1967. Psyche 74: 228-233 (effect of queen on longevity of workers).

**fallax** Borgmeier. La., Kans., Tex., N. Mex., Ariz.; Mexico; Guatemala. Only the worker is known. Literature references for *commutatum* (Emery) for N. Amer. north of Mexico should be referred to *fallax*.

*Neivamyrmex fallax* Borgmeier, 1953. Studia Ent. 2: 48. ♀.

**fuscipennis** (Wheeler). Kans., e. Tex. Only the male is known.

*Acamatus fuscipennis* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24: 417. ♂. Misdet. as *spoliator* Forel, but *fuscipennis* validated by pl. 26, fig. 12.

Taxonomy: Watkins, 1975. Southwest. Nat. 20: 85-90 (relationship to *N. macropterus* Borgmeier; lectotype).

**harrisii** (Haldeman). Okla., Tex., N. Mex., Ariz.; Mexico. All castes are known. Records citing this species from Utah are probably incorrect.

*Labidus harrisii* Haldeman, 1852. In Stanbury, Exped. Great Salt Lake, p. 367. ♂.

*Eciton wheeleri* Emery, 1901. Soc. Ent. Ital., Bol. 33: 65. ♀.

*Eciton (Acamatus) wheeleri dubia* Creighton, 1932. Psyche 39: 75. ♀, ♀.

Taxonomy: Watkins, 1968. Amer. Midland Nat. 80: 273-275 (association of castes). —Borgmeier, 1958. Studia Ent. 1: 206-207.

Biology: Watkins and Cole, 1966. Tex. Jour. Sci. 12: 254-265 (attraction of workers to secretion of queens). —Watkins, Cole, and Baldrige, 1967. Kans. Ent. Soc., Jour. 40: 146-151 (trail following and trail preference). —Plsek, Kroll, and Watkins, 1969. Kans. Ent. Soc., Jour. 42: 452-456 (carabids in raiding columns).

Morphology: Forbes and Do-Van-Quy, 1965. N. Y. Ent. Soc., Jour. 73: 95-111 (male reproductive system).

**leonardi** (Wheeler). Okla., Tex., Calif.; Mexico. Only the worker is known.

*Eciton (Acamatus) leonardi* Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34: 392. ♀.

*Eciton (Acamatus) peninsulare* Mann, 1926. Psyche 33: 98. ♀.

Taxonomy: Borgmeier, 1953. Studia Ent. 2: 10. —Watkins, 1971. Kans. Ent. Soc., Jour. 44: 101-103 (worker; biological notes).

- Biology: Watkins and Cole, 1966. *Tex. Jour. Sci.* 18: 254-265 (= *pauvillus* of authors, not \* Wheeler; attraction of workers to secretion of queens). — Watkins, Cole, and Baldrige, 1967. *Kans. Ent. Soc., Jour.* 40: 146-151 (= *pauvillus* of authors, not Wheeler; trail following and trail preference).
- macropterus** Borgmeier. W. Tex., N. Mex., Ariz.; Mexico. only the male is known.  
*Neivamyrmex macropterus* Borgmeier, 1953. *Studia Ent.* 2: 40. ♂.
- Taxonomy: Watkins, 1975. *Southwest. Nat.* 20: 35-89 (relationship to *fuscipennis* (Wheeler)).
- melanocephalus** (Emery). S. Ariz. to Honduras. Only the worker is known.  
*Eciton (Acamatus) melanocephalum* Emery, 1895. *Zool. Jahrb. Abt. f. System.* 8: 260. ♀.  
*Eciton (Acamatus) melanocephalum rize* Wheeler, 1914. *N. Y. Ent. Soc., Jour.* 22: 41. ♀.
- melshimeri** (Haldeman). La., Okla., Tex.; s. to Costa Rica. Only the male is known. Records citing this species from Utah are probably incorrect.  
*Labidus melshimeri* (!) Haldeman, 1852. *In* Stanbury, *Exped. Great Salt Lake*, p. 368. ♂.
- Biology: Wheeler, 1908. *Amer. Mus. Nat. Hist., Bul.* 24: 418.
- microps** Borgmeier. Ariz. (Phoenix). Only the male is known.  
*Neivamyrmex microps* Borgmeier, 1955. *Studia Ent.* 3: 635. ♂.
- minor** (Cresson). Kans., Okla., Tex., N. Mex., Ariz., Nev., Calif.; Mexico. Only the male is known. One of the smallest of our legionary ants.  
*Labidus minor* Cresson, 1872. *Amer. Ent. Soc., Trans.* 4: 195. ♂.
- Taxonomy: Wheeler, 1908. *Amer. Mus. Nat. Hist., Bul.* 24: 418 (male).
- Biology: Wheeler and Long, 1901. *Amer. Nat.* 35: 165. — Cole, 1966. *Brigham Young Univ., Sci. Bul.* 7: 26.
- mojave** (Smith). Calif. (Mojave Desert). Only the male is known.  
*Eciton (Neivamyrmex) mojave* Smith, 1943. *Lloydia* 6: 196. ♂.
- moseri** Watkins. La., Tex. Ecology: Collected from a nest of *Atta texana* (Buckley) in La. Only the worker and queen are known.  
*Neivamyrmex moseri* Watkins, 1968. *Kans. Ent. Soc., Jour.* 41: 528-531. ♀.
- Taxonomy: Watkins, 1971. *Kans. Ent. Soc., Jour.* 44: 95-99 (worker, queen; also biological notes).
- nigrescens** (Cresson). W. Va., Ky., Tenn., Ga., Ala., Miss., Ill., Iowa, Mo., Ark., La., Nebr., Kans., Okla., Tex., Colo., N. Mex., Ariz., Calif.; Mexico. Ecology: Temporary nesting sites are in decayed logs or stumps or in the ground beneath stones and other objects. Many foraging activities take place in daylight, and they are highly predaceous on other insects. Large colonies contain 150,000 to 250,000 workers. Each colony has one functional queen, and new colonies are formed by splitting. All castes are known.  
*Labidus nigrescens* Cresson, 1872. *Amer. Ent. Soc., Trans.* 4: 194. ♂.  
*Eciton (Acamatus) Schmitti* Emery, 1894. *Soc. Ent. Ital, Bol.* 26: 183. ♀.
- Taxonomy: Wheeler, 1943. *Ent. Soc. Amer., Ann.* 36: 331 (larva). — Watkins, 1972. *Kans. Ent. Soc., Jour.* 45: 358-363 (worker, distribution).
- Biology: Wheeler, 1900. *Amer. Nat.* 34: 565-574 (*sumichrasti*, not Norton). — Smith, 1927. *Ent. Soc. Amer., Ann.* 20: 401-404. — Cole, 1953. *Tenn. Acad. Sci., Jour.* 28: 84. — Schneirla, 1958. *Insectes Sociaux* 5: 215-255. — Rettenmeyer, 1963. *Univ. Kans., Sci. Bul.* 44: 446-452. — Gregg, 1963. *Ants of Colo.*, pp. 286-288. — Watkins, 1964. *Kans. Ent. Soc., Jour.* 37: 22-28 (trail following). — Smith, 1965. *U. S. Dept. Agr., Tech. Bul.* 1326, pp. 18-19. — Watkins and Cole, 1966. *Tex. Jour. Sci.* 18: 254-265 (attraction of workers to secretion of queens). — Watkins, Cole, and Baldrige, 1967. *Kans. Ent. Soc., Jour.* 40: 146-151 (trail following and trail preference). — Watkins, Gehlbach, and Baldrige, 1967. *Southwest. Nat.* 12: 455-462 (blind snake follows pheromone trails of *nigrescens*). — Watkins, Gehlbach, and Kroll, 1969. *Ecology* 50: 1098-1102 (attractant, repellent secretions). — Plsek, Kroll, and Watkins, 1969. *Kans. Ent. Soc., Jour.* 42: 452-456 (carabids in raiding columns). — Topoff, 1969. *N. Y. Ent. Soc., Jour.* 77: 273-274 (communication). — Topoff, 1969. *Psyche* 76: 375-381 (predatory association between carabids and *nigrescens*). — Topoff, 1970. *N. Y. Ent. Soc., Jour.* 78: 239-240 (cyclic behavior). — Watkins, Gehlbach, and Plsek, 1972. *Tex. Jour. Sci.* 23: 34. (behavior of blind snakes in response to raiding columns).

- Morphology: Borgmeier, 1957. Rev. Brasil. Biol. 17: 393 (maxillary and labial palpi).
- opacithorax** (Emery). Va., N. C., S. C., Ga., Fla., Tenn., Ala., Mo., Ark., Kans., Okla., Tex., N. Mex., Ariz., Calif.; Mexico to Costa Rica. Ecology: Habits are similar to those of *nigrescens* (Cresson). All castes are known.
- Eciton (Acamatus) californicum opacithorax* Emery, 1894. Soc. Ent. Ital., Bol. 26: 184. ♀.
- Eciton (Acamatus) opacithorax castaneum* Borgmeier, 1939. Rev. de Ent. 10: 416. ♀.
- Biology: Wheeler and Long, 1901. Amer. Nat. 35: 163, 172. —Smith, 1924. Ent. News 35: 84. —Cole, 1953. Tenn. Acad. Sci., Jour. 28: 84. —Schneirla, 1958. Insectes Sociaux 5: 215-255. —Rettenmeyer, 1963. Univ. Kans., Sci. Bul. 44: 437-446. —Watkins, 1964. Kans. Ent. Soc., Jour. 37: 22-28 (trail following). —Smith, 1965. U. S. Dept. Agr., Tech. Bul. 1326, pp. 19-20. —Watkins and Cole, 1966. Tex. Jour. Sci. 18: 254-265 (attraction of workers to secretion of queens). —Watkins, Cole, and Baldrige, 1967. Kans. Ent. Soc., Jour. 40: 146-151 (trail following and trail preference). —Watkins, Gehlbach, and Baldrige, 1967. Southwest. Nat. 12: 455-462 (a blind snake follows pheromone trails of *opacithorax*).
- Morphology: Borgmeier, 1957. Rev. Brasil. Biol. 17: 393 (maxillary and labial palpi).
- pauxillum** (Wheeler). Tex.; Mexico. Only the worker and queen are known.
- Eciton (Acamatus) pauxillum* Wheeler, 1903. Psyche 10: 93. ♀.
- Taxonomy: Watkins, 1971. Kans. Ent. Soc., Jour. 44: 99-101 (worker, queen; biological notes).
- Biology: Smith, 1938. Ent. Soc. Wash., Proc. 40: 158.
- pilosus mandibularis** (Smith). N. Mex., Ariz. Only the male is known. *N. pilosus pilosus* (Smith) is found in S. Amer.
- Eciton (Neivamyrmex) pilosum mandibulare* Smith, 1942. Amer. Midland Nat. 27: 543, 548. ♂.
- pilosus mexicanus** (Smith). Miss., Ark., La., Okla., Tex., Calif., s. to Colombia. All castes are known.
- Labidus Mexicanus* Smith, 1859. Cat. Hym. Brit. Mus., v.7, p. 7. ♂.
- Eciton clavicornis* Norton, 1868. Amer. Ent. Soc., Trans. 2: 46. ♀.
- Eciton (Labidus) subsulcatum* Mayr, 1886. Zool.-Bot. Gesell. Wien, Verh. 36: 440. ♂.
- Eciton (Acamatus) aztecum* Forel, 1901. Mitt. Nat. Mus. Hamburg 18: 49. ♀.
- Eciton (Labidus) spininode militarium* Santschi, 1929. Wien Ent. Ztg. 46: 85. ♀.
- Taxonomy: Borgmeier, 1936. Inst. Biol. Veg. Arq. 3: 60. —Reichensperger, 1939. Zool. Jahrb. Abt. f. System. 73: 297-300.
- Biology: Smith, 1924. Ent. News 35: 85. —Watkins and Cole, 1966. Tex. Jour. Sci. 18: 254-265 (attraction of workers to secretion of queens). —Watkins, Cole, and Baldrige, 1967. Kans. Ent. Soc., Jour. 40: 146-151 (trail following and trail preference).
- rugulosus** Borgmeier. S. Ariz.; Mexico. Only the worker is known.
- Neivamyrmex rugulosus* Borgmeier, 1953. Studia Ent. 2: 49. ♀.
- swainsonii** (Shuckard). La., Tex., N. Mex., Ariz., Calif.; s. to Argentina. Only the male is known.
- Labidus swainsonii* Shuckard, 1840. Ann. Nat. Hist. 5: 201. ♂.
- Eciton (Acamatus) arizonense* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24: 414. ♂.
- texanus** Watkins. Va., N. C., S. C., Ga., Fla., Tex., Colo., N. Mex., Ariz.; Mexico. All castes are known.
- Neivamyrmex texanus* Watkins, 1972. Kans. Ent. Soc., Jour. 45: 353-358. ♀, ♀, ♂.
- Taxonomy: Wheeler and Long, 1901. Amer. Nat. 35: 161 (male described as *schmitti*). —Borgmeier, 1955. Studia Ent. 3: 496 (male described as *nigrescens*).

## UNPLACED TAXON OF DORYLINAE

- Myrmica (Monomarium(!)) coeca* Buckley, 1867. Ent. Soc. Phila., Proc. 6: 339. ♀. Tex. (San Saba Co.).



## SUBFAMILY CERAPACHYINAE

This small subfamily, found in the tropical regions of the world, exhibits a blending of doryline and ponerine traits both morphologically and biologically. Only three species are known from north of Mexico. Little is known concerning the behavior of the New World forms, but they are predaceous and carnivorous and the colonies are small. Wilson (1958) studied the behavior of several species from Melanesia and Australia and found them all to be myrmecophagous, feeding on the broods and sometimes adults of other species of ants. He suggested that these ants carry on an alternating, group foraging and raiding behavior pattern by which the colony efficiently exploits the surrounding territory.

After this section was completed, Brown (1975) published on the Cerapachyinae and regarded the Cerapachyini and Acanthostichini as tribes of the Ponerinae, consequently not recognizing the Cerapachyinae as a subfamily.

Revision: Brown, 1975. Search, Agr., Ent. (Ithaca) 15, 5 (1): 14-36 (Cerapachyini and Acanthostichini as tribes of Ponerinae; biol. notes; keys to world genera and species).

Taxonomy: Wheeler, 1920. Psyche 27: 50-51. —Donisthorpe, 1921. London Ent. Soc., Proc., pp. xlv-xlvii. —Wheeler, 1922. Amer. Mus. Nat. Hist., Bul. 45: 51-52. —Morley, 1939. Soc. Ent. France, Bul. 44: 114-118. —Reid, 1941. Roy. Ent. Soc. London, Trans. 91: 421-422. —Creighton, 1950. Harvard Univ., Mus. Compar. Zool., Bul. 104: 56-59. —Wheeler, 1950. Psyche 57: 102-113 (larvae). —Kuznezov, 1952. Dusenja 3: 115. —Brown, 1954. Insectes Sociaux 1: 26-27. —Wheeler and Wheeler, 1964. Ent. Soc. Wash., Proc. 66: 65-71 (larvae). —Wheeler and Wheeler, 1973. Psyche 80: 204-211 (larvae).

Biology: Wilson, 1958. Insectes Sociaux 5: 129-140 (behavior of certain Melanesian and Australian species).

## TRIBE CERAPACHYINI

## Genus CERAPACHYS Smith

*Cerapachys* Smith, 1858. Linn. Soc. London, Jour. 2: 74.

Type-species: *Cerapachys antennatus* Smith. Monotypic.

*Syscia* Roger, 1861. Berlin. Ent. Ztschr. 5: 19.

Type-species: *Syscia typhla* Roger. Monotypic.

*Parasyscia* Emery, 1882. In Andre, Spec. Hym. Eur. Alg. 2: 235.

Type-species: *Parasyscia piochardi* Emery. Monotypic.

A pantropical genus with about 8 New World species, two of which are found in southwestern United States. For additional generic synonymy, see Brown, 1975 Search, Agr., Ent. (Ithaca) 15, 5 (1): 18-19.

Taxonomy: Kempf, 1972. Studia Ent. 15: 76 (generic synonymy).

*augustae* Wheeler. Tex., Ariz.; Mexico. The type colony from Austin, Tex., was found 6 inches below the surface of soil containing limestone chips; 10 workers and a female were found. Other specimens were found in the stomach of an armadillo.

*Cerapachys (Parasyscia) augustae* Wheeler, 1902. Biol. Bul. 3: 182. ♀, ♀.

Taxonomy: Smith, 1942. Ent. Soc. Wash., Proc. 44: 63 (male). —Wheeler, 1950. Psyche 57: 106-107 (larva).

Biology: Wheeler, 1903. Psyche 10: 205-209.

*davisi* Smith. Tex. (Ft. Davis, 5,000 ft.).

*Cerapachys (Parasyscia) davisi* Smith, 1942. Ent. Soc. Wash., Proc. 44: 64. ♂.

## TRIBE ACANTHOSTICHINI

## Genus CTENOPYGA Ashmead

*Ctenopyga* Ashmead, 1905. Canad. Ent. 37: 382. Nom. nud.

*Ctenopyga* Ashmead, 1906. Ent. Soc. Wash., Proc. 8: 29.

Type-species: *Ctenopyga townsendi* Ashmead. Monotypic.

*texanus* (Forel). Tex.; Mexico.

*Acanthostichus texanus* Forel, 1904. Soc. Ent. Belg., Ann. 48: 168. ♀.

*Ctenopyga townsendi* Ashmead, 1906. Ent. Soc. Wash., Proc. 8: 29-30. ♀, ♂.

Taxonomy: Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24: 400 (female). —Smith, 1955. Brooklyn Ent. Soc., Bul. 50: 48-50 (synonymy).

#### SUBFAMILY PONERINAE

One of the smaller subfamilies of ants, with most species found in the tropical regions of the world. Most of the North American forms are either northern extensions of Neotropical taxa or have been introduced by commerce from other parts of the world. These are primitive ants which nest in small colonies of a few hundred individuals or less, mostly in soil or rotting wood. They are predaceous and carnivorous.

Taxonomy: Wheeler and Wheeler, 1952. Amer. Midland Nat. 48: 111-144 (larvae). —Wheeler and Wheeler, 1964. Ent. Soc. Amer., Ann. 57: 443-462 (larvae). —Wheeler and Wheeler, 1971. Ent. Soc. Amer., Ann. 64: 1197-1217 (larvae). —Wheeler and Wheeler, 1974. Ent. Soc. Wash., Proc. 76: 278-281 (larvae). —Wheeler and Wheeler, 1976. Amer. Ent. Soc., Trans. 102: 41-64 (supplementary studies on larvae).

Biology: Wheeler, 1910. Ants, pp. 225-245. —Wilson, 1958. Evolution 12: 24-31 (beginnings of nomadic and group-predatory behavior).

#### TRIBE AMBLYOPONINI

Revision: Brown, 1960. Harvard Univ., Mus. Comp. Zool., Bul. 122: 145-230.

#### Genus AMBLYOPONE Erichson

*Amblyopone* Erichson, 1842. Arch. f. Naturgesch. 8: 260.

Type-species: *Amblyopone australis* Erichson. Monotypic.

*Stigmatomma* Roger, 1859. Berlin Ent. Ztschr. 3: 250.

Type-species: *Stigmatomma denticulatum* Roger. Desig. by Bingham, 1903.

*Arotropus* Provancher, 1881. Nat. Canad. 12: 205.

Type-species: *Arotropus binodosus* Provancher. Monotypic.

*Amblyopopona* Schulz, 1906. Spolia Hym., p. 154. Emend.

*Stigmatomma* subg. *Xymmer* Santschi, 1914. Bol. Lab. Zool. Gen. e Agr. Portici 8: 311.

Type-species: *Stigmatomma (Xymmer) muticum* Santschi. Monotypic.

*Stigmatomma* subg. *Fulakora* Mann, 1919. Harvard Univ., Mus. Comp. Zool., Bul. 63: 279.

Type-species: *Stigmatomma (Fulakora) celata* Mann. Orig. desig.

*Amblyopone* subg. *Neoamblyopone* Clark, 1927. In Wheeler, Amer. Acad. Arts and Sci., Proc. 62: 1.

Type-species: *Amblyopone (Neoamblyopone) clarki* Wheeler. Monotypic.

*Amblyopone* subg. *Protamblyopone* Clark, 1927. In Wheeler, Amer. Acad. Arts and Sci., Proc. 62: 1.

Type-species: *Amblyopone (Protamblyopone) aberrans* Wheeler. Monotypic.

*Lithomyrmex* Clark, 1928. Roy. Soc. W. Australia, Jour. 14: 30.

Type-species: *Lithomyrmex glauerti* Clark. Orig. desig.

*Ericapella* Kusnezov, 1955. Zool. Anz. 154: 273.

Type-species: *Ericapella egregia* Kusnezov, Monotypic.

This genus is represented in the tropical and temperate regions of the world though it is more highly developed in the Australian Region than elsewhere. The Nearctic forms commonly occur in wooded areas, especially those that are well shaded. They are subterranean, and the workers are timid and slow of movement. The female of *pallipes* forages for food during the period of nest founding, an archaic habit in ants.

Revision: Creighton, 1940. Amer. Mus. Novitates 1079: 1-8. —Brown, 1960. Harvard Univ., Mus. Comp. Zool., Bul. 122: 155-169.

Taxonomy: Brown, 1949. Psyche 56: 81-88. —Wheeler and Wheeler, 1964. Ent. Soc. Amer., Ann. 57: 444-446 (larvae).

- Biology: Haskins and Haskins, 1951. Amer. Midland Nat. 45: 432-445 (colony founding of *A. australis* Erichson).
- Morphology: Eisner, 1957. Harvard Univ., Mus. Comp. Zool., Bul. 116: 476 (proventriculus).
- oregonense** (Wheeler). B. C., Wash., Oreg., Calif. Ecology: Usually at low elevations in the coastal mountains.
- Stigmatomma pallipes oregonense* Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34: 389. ♀, ♀.
- Taxonomy: Brown, 1960. Harvard Univ., Mus. Comp. Zool., Bul. 122: 169, 183.
- pallipes** (Haldeman). Ont., Que. s. to Ga. w. to Wis., Iowa, Okla., Colo., Tex., Ariz. Ecology: The small colonies are most common in areas of heavy cover and considerable precipitation. Chilopods appear to be the main food source.
- Typhlopone pallipes* Haldeman, 1844. Acad. Nat. Sci. Phila., Proc. 2: 54. ♀.
- Stigmatomma serratum* Roger, 1859. Berlin. Ent. Ztschr. 3: 251. ♀.
- Arotropus binodosus* Provancher, 1881. Nat. Canad. 12: 206. ♀.
- Stigmatomma pallidipes*(!) var. *Wheeleri* Santschi, 1913. Soc. Ent. Belg., Ann. 57: 429. ♀, ♀, ♂.
- Stigmatomma pallipes arizonense* Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34: 389. ♀.
- Stigmatomma pallipes montigena* Creighton, 1940. Amer. Mus. Novitates 1079: 2, 7. ♀, ♀.
- Stigmatomma pallipes subterranea* Creighton, 1940. Amer. Mus. Novitates 1079: 3, 8. ♀.
- Taxonomy: Emery, 1895. Zool. Jahrb., Abt. f. System. 8: 261-262 (each caste). —Wheeler and Wheeler, 1952. Amer. Midland Nat. 48: 114 (larva). —Brown, 1960. Harvard Univ., Mus. Comp. Zool., Bul. 122: 169, 183-185. —Francoeur and Beique, 1966. Canad. Ent. 98: 141 (Provancher types).
- Biology: Wheeler, 1900. Biol. Bul. 2: 56-64. —Haskins, 1928. N. Y. Ent. Soc., Jour. 36: 179-184. —Buren, 1944. Iowa State Col., Jour. Sci. 18: 279. —Cole, 1953. Tenn. Acad. Sci., Jour. 28: 84. —Gregg, 1963. Ants of Colo., pp. 279-282.
- Morphology: Whelden, 1957. N. Y. Ent. Soc., Jour. 65: 1-21 (anatomy). —Gotwald, 1969. N. Y. Agr. Expt. Sta. (Cornell Univ.), Mem. 408: 25-42 (mouthparts).
- trigonignatha** Brown. N. C. (Concord). Ecology: Sifted from leaf mold in Berlese funnel.
- Amblyopone (Stigmatomma) trigonignatha* Brown, 1949. Psyche 56: 81-84. ♀.
- Taxonomy: Brown, 1960. Harvard Univ., Mus. Comp. Zool., Bul. 122: 169, 185.

### Genus PRIONOPELTA Mayr

- Prionopelta* Mayr, 1866. Akad. der Wiss. Wien, Math.-Nat. Kl. Sitzber. 53: 503.
- Type-species: *Prionopelta punctulata* Mayr. Monotypic.
- Renea* Donisthorpe, 1947. Ann. and Mag. Nat. Hist. (11) 14: 183. Preocc. by Nevill, 1880.
- Type-species: *Renea testacea* Donisthorpe. Orig. desig.
- Examblyopone* Donisthorpe, 1949. Ann. and Mag. Nat. Hist. (12) 2: 401.
- Type-species: *Examblyopone churchilli* Donisthorpe. Orig. desig.
- A tropicopolitan genus of small, soil-inhabiting ants.
- Revision: Brown, 1960. Harvard Univ., Mus. Comp. Zool., Bul. 122: 173-178.
- Taxonomy: Brown, 1951. Brooklyn Ent. Soc., Bul. 46: 102. —Wheeler and Wheeler, 1952. Amer. Midland Nat. 48: 120 (larvae). —Brown, 1953. Breviora 11: 11. —Wheeler and Wheeler, 1964. Ent. Soc. Amer., Ann. 57: 447 (larvae; *Prinopelta*(!)).
- antillana** Forel. Fla. (Juniper Springs, Marion Co.); W. Indies, Central America to Brazil, Bolivia (?). Ecology: Specimens have been found in soil.
- Prionopelta punctulata antillana* Forel, 1909. Deut. Ent. Ztschr., p. 239. ♀.
- Taxonomy: Brown, 1960. Harvard Univ., Mus. Comp. Zool., Bul. 122: 178.
- Biology: Kempf, 1961. Studia Ent. 4: 489-490 (in soil samples in Surinam).

### TRIBE PLATYTHYREINI

- Revision: Brown, 1975. Search, Agr., Ent. (Ithaca) 15, 5 (1): 4-11 (world genera and species).

Taxonomy: Brown, 1952. *Breviora* 6: 1-6.

### Genus PLATYTHYREA Roger

*Platythyrea* Roger, 1863. Berlin Ent. Ztschr. 7: 172.

Type-species: *Pachycondyla punctata* Smith. Desig. by Bingham, 1903.

A tropicopolitan genus with 8 Neotropical species, only one of which reaches the United States.

Taxonomy: Brown, 1952. *Breviora* 6: 4 (in key). —Wheeler and Wheeler, 1964. Ent. Soc. Amer., Ann. 57: 446 (larvae). —Wheeler and Wheeler, 1976. Amer. Ent. Soc., Trans. 102: 41 (revised characterization of larvae).

**punctata** (Smith). S. Fla. and s. Tex., s. to W. Indies, Central Amer., and Brazil. Ecology:

Nests in small colonies up to a few hundred individuals each, usually in rotten logs and stumps or under the bark of trees in shady situations. Workers are active, forage singly, and are carnivorous and predatory.

*Pachycondyla punctata* Smith, 1858. Cat. Hym. Brit. Mus., v. 6, p. 108. ♀, ♂.

*Platythyrea pruinosa* Mayr, 1870. Zool.-Bot. Gesell. Wien, Verh. 20: 962. ♀.

Taxonomy: Forel, 1893. Ent. Soc. London, Trans., p. 358 (worker, female). —Mann, 1916. Harvard Univ., Mus. Comp. Zool., Bul. 60: 403. —Wheeler and Wheeler, 1952. Amer. Midland Nat. 48: 119 (larva).

Biology: Forel, 1899. Rev. Suisse Zool. 9: 335 (in Barbados). —Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21: 80 (in Bahamas). —Smith, 1936. Puerto Rico Univ., Jour. Agr. 20: 824 (in Puerto Rico). —Brown, 1957. Harvard Univ., Mus. Comp. Zool., Bul. 116: 229 (in Mexico).

### TRIBE ECTATOMMINI

Revision: Brown, 1958. Harvard Univ., Mus. Comp. Zool., Bul. 118: 175-362.

### Genus ECTATOMMA Smith

*Ectatomma* Smith, 1859. Cat. Hym. Brit. Mus., v. 6, p. 102.

Type-species: *Formica tuberculata* Olivier. Desig. by Bingham, 1903.

A Neotropical genus of about 14 species, none of which are native to the United States. One species was introduced into southern Texas for biological control purposes, but the attempt failed.

Revision: Brown, 1958. Harvard Univ., Mus. Comp. Zool., Bul. 118: 206-211, 295-299.

Taxonomy: Wheeler and Wheeler, 1964. Ent. Soc. Amer., Ann. 57: 449 (larvae).

Biology: Weber, 1946. Ent. Soc. Wash., Proc. 48: 1-16 (*E. tuberculatum* (Olivier) and *E. ruidum* (Roger)).

**tuberculatum** (Olivier). S. Tex. (?); Mexico to n. Argentina. Ecology: Nests are in the soil and are composed of several hundred individuals. Workers are predatory and carnivorous and also attend membracids and aphids on plants. Introduced into Victoria Co., Texas from Guatemala in 1904-1905 to combat the cotton boll weevil. The attempted introduction led to a fiery confrontation between O. F. Cook, instigator of the experiment, and W. M. Wheeler. Known as the kelep.

*Formica tuberculata* Olivier, 1791. Encycl. Meth., Dict. Ins., v. 6, p. 498. ♀.

*Formica tridentata* Fabricius, 1804. Systema Piezatorum, p. 42. ♀.

*Ectatomma ferrugineus* Norton, 1868. Comm. Essex Institute 6: 5. ♀, ♂.

*Ectatomma tuberculatum* var. *punctigerum* Emery, 1890. Soc. Ent. France, Ann. 10: 56. ♀.

*Ectatomma tuberculatum* var. *acrista* Forel, 1909. Deut. Ent. Ztschr., p. 254. ♀, ♀.

*Ectatomma tuberculatum* var. *irregularis* Santschi, 1921. Soc. Vaud. Nat. des Sci., Bul. 54: 83. ♀.

Taxonomy: Lever, 1930. Ent. Monthly Mag. 66: 214 (female). —Wheeler and Wheeler, 1952. Amer. Midland Nat. 48: 129-133 (larva). —Brown, 1958. Harvard Univ., Mus. Comp. Zool., Bul. 118: 209, 211, 298-299. —Kempf, 1962. Studia Ent. 5: 2-3.

Biology: Cook, 1904. U. S. Dept. Agr., Div. Ent., Bul. 49: 1-15. —Cook, 1904. Science 19: 862-864. —Cook, 1904. Science 20: 310-312 (pupation). —Wheeler, 1904. Science 20: 437-440 (pupation; feasibility of introduction). —Cook, 1904. Science 20: 611-612. —Wheeler, 1904. Science 20: 766-768. —Cook, 1905. U. S. Dept. Agr., Bur. Ent., Tech. Ser. 10: 1-55. —Wheeler, 1905. Science 21: 706-710 (criticism of Cook's work). —Cook, 1906. Science 23: 187-189. —Wheeler, 1906. Science 23: 348-350. —Weber, 1946. Ent. Soc. Wash., Proc. 48: 1-16 (biology and economic significance).

Morphology: Haskins and Enzmann, 1938. N. Y. Acad. Sci., Ann. 37: 100-162 (physiology). —Gotwald, 1969. N. Y. Agr. Expt. Sta. (Cornell Univ.), Mem. 408: 25-42 (mouthparts).

### Genus GNAMPTOGENYS Roger

*Gnamptogenys* Roger, 1863. Berlin Ent. Ztschr. 7: 174.

Type-species: *Ponera tornata* Roger. Desig. by Emery, 1911.

*Ectatomma* subg. *Stictoponera* Mayr, 1887. Zool.-Bot. Gesell. Wien, Verh. 37: 539.

Type-species: *Ectatomma coxale* Roger. Desig. by Bingham, 1903.

*Ectatomma* subg. *Holcoponera* Mayr, 1887. Zool.-Bot. Gesell. Wien, Verh. 37: 540.

Type-species: *Gnamptogenys striatula* Mayr. Desig. by Emery, 1911.

*Alfaria* Emery, 1896. Soc. Ent. Ital., Bul. 28: 41.

Type-species: *Alfaria simulans* Emery. Monotypic.

*Ectatomma* subg. *Poneracantha* Emery, 1897. Mus. Civ. Stor. Nat. Genova, Ann. 38: 547.

Type-species: *Ectatomma* (*Holcoponera*?) *bispinosum* Emery. Monotypic.

*Rhopalopone* Emery, 1897. Mus. Civ. Stor. Nat. Genova, Ann. 38: 549.

Type-species: *Rhopalopone epinotalis* Emery. Monotypic.

*Emeryella* Forel, 1901. Soc. Ent. Belg., Ann. 45: 334.

Type-species: *Emeryella schmitti* Forel. Monotypic.

*Ectatomma* subg. *Mictoponera* Forel, 1901. Soc. Ent. Belg., Ann. 45: 372.

Type-species: *Ectatomma* (*Mictoponera*) *diehli* Forel. Monotypic.

*Ectatomma* subg. *Parectatomma* Emery, 1911. In Wytsman, Gen. Ins., fasc. 118, p. 44.

Type-species: *Ectatomma* (*Gnamptogenys*) *triangulare* Mayr. Orig. desig.

*Spaniopone* Wheeler and Mann, 1914. Amer. Mus. Nat. Hist., Bul. 33: 11.

Type-species: *Spaniopone haytiana* Wheeler and Mann. Monotypic.

*Wheeleripone* Mann, 1919. Harvard Univ., Mus. Comp. Zool., Bul. 63: 282.

Type-species: *Wheeleripone albiclava* Mann. Orig. desig.

*Opisthoscyphus* Mann, 1922. U. S. Natl. Mus., Proc. 61: 4.

Type-species: *Opisthoscyphus scabrosus* Mann. Monotypic.

*Ectatomma* subg. *Commateta* Santschi, 1929. Zool. Anz. 82: 476.

Type-species: *Ectatomma* (*Parectatomma*) *bruchi* Santschi. Orig. desig.

*Ectatomma* subg. *Tammotoca* Santschi, 1929. Zool. Anz. 82: 476.

Type-species: *Ectatomma concinna* Smith. Orig. desig.

*Emeryella* subg. *Barbourella* Wheeler, 1930. New England Zool. Club, Proc. 12: 10.

Type-species: *Emeryella* (*Barbourella*) *banksi* Wheeler. Orig. desig.

Brown (1958) treated 81 species of which about 64 are found in the New World tropics and divided the genus into four species groups. The question has been raised as to whether our only species is native or adventive.

Revision: Brown, 1958. Harvard Univ., Mus. Comp. Zool., Bul. 118: 211-241, 299-330.

Taxonomy: Wheeler and Wheeler, 1952. Amer. Midland Nat. 48: 133-134 (larvae). —Wheeler and Wheeler, 1964. Ent. Soc. Amer., Ann. 57: 540 (larvae). —Wheeler and Wheeler, 1976. Amer. Ent. Soc., Trans. 102: 43 (revised characterization of larvae).

**hartmani** (Wheeler). La. (Lucky), Tex. (Huntsville); Honduras. Ecology: Specimens have been taken from soil under banana trees in Honduras and from nests of *Trachymyrmex septentrionalis* (McCook) in La.

*Ectatomma* (*Parectatomma*) *hartmani* Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34: 390. ♀.

Taxonomy: Brown, 1958. Harvard Univ., Mus. Comp. Zool., Bul. 118: 228, 230, 234, 302.

—Brown, 1961. Psyche 68: 69 (from Honduras; single worker from Tex. described by Wheeler possibly a locality error or adventive specimen).

Biology: Echols, 1964. Ent. Soc. Amer., Ann. 57: 137 (La.; first reproductive colonies taken in U. S.).

### Genus PROCERATIUM Roger

*Proceratium* Roger, 1863. Berlin. Ent. Ztschr. 7: 171.

Type-species: *Proceratium silaceum* Roger. Monotypic.

*Sysphingia* Roger, 1863. Berlin. Ent. Ztschr. 7: 175.

Type-species: *Sysphingia micrommata* Roger. Monotypic.

*Sysphincta* Mayr, 1865. Reise d. Novara, Zool. 1 (1) Formicidae, p. 12. Emend.

About 24 world species are known, most of which are found in the warmer parts of the northern temperate region of the world. They are hypogaeic, and the small colonies of two or three dozen individuals are found in well-rotted, moist wood such as that of logs and stumps. A constant, high moisture content is essential. Toward the cooler areas they may be under the deepest rocks. Workers are sluggish and carnivorous, apparently feeding almost exclusively on the eggs of other Arthropods.

Revision: Emery, 1895. Zool. Jahrb., Abt. f. System. 8: 264-266. —Brown, 1958. Harvard Univ., Mus. Comp. Zool., Bul. 118: 241-248.

Taxonomy: Wheeler and Wheeler, 1952. Amer. Midland Nat. 48: 135-137. (larvae). —Wheeler and Wheeler, 1964. Ent. Soc. Amer., Ann. 57: 451 (larvae). —Snelling, 1967. Los Angeles Co. Mus., Contrib. Sci. 124: 1-10 (key to New World species). —Wheeler and Wheeler, 1971. Ent. Soc. Amer., Ann. 64: 1202 (larvae).

Biology: Brown, 1958. Psyche 65: 115 (predation of arthropod eggs).

**californicum** Cook. Calif. Found in several scattered localities from Sutter Co. to Los Angeles Co. The worker is unknown.

*Proceratium*(!) *californicum* Cook, 1953. The Ants of Calif., pp. 45-46. ♂.

Taxonomy: Snelling, 1967. Los Angeles Co. Mus., Contrib. Sci. 124: 1-10 (female, male).

**croceum** (Roger). Va. to Fla. w. to Ill., Tex.

*Ponera crocea* Roger, 1860. Berlin Ent. Ztschr. 4: 288. ♀.

Taxonomy: Emery, 1895. Zool. Jahrb., Abt. f. System. 8: 264 (worker, female). —Smith, 1930.

Ent. Soc. Amer., Ann. 23: 390-392 (male). —Wheeler and Wheeler, 1952. Amer. Midland Nat. 48: 135 (larva).

Biology: Haskins, 1930. N. Y. Ent. Soc., Jour. 38: 121-126. —Brown, 1958. Harvard Univ., Mus. Comp. Zool., Bul. 118: 246-247.

**melinum** (Roger). "Carolina"; Europe. A European species that doubtfully occurs in North America and has not been collected here since it was originally described; types may have been mislabeled.

*Ponera melina* Roger, 1860. Berlin. Ent. Ztschr. 4: 291. ♀, ♀, ♂.

*Sysphingia europaea* Forel, 1886. Soc. Ent. Belg., Ann. (C. R.) 30: CLXIII. ♀.

*Sysphincta europaea rossica* Arnoldi, 1930. Zool. Anz. 91: 144. ♀, ♀.

*Sysphincta fialai* Kratochvil, 1944. In "Mohelno." Arch. Svaz ochr. prir. dom. Morave, Svazek 6: 54, 86.

Taxonomy: Brown, 1958. Harvard Univ., Mus. Comp. Zool., Bul. 118: 243, 246-248, 334 (doubtful in N. Amer.; also biological notes).

**pergandei** (Emery). Mass. to Fla. w. to Iowa, Ark., La.

*Sysphincta pergandei* Emery, 1895. Zool. Jahrb., Abt. f. System. 8: 264. ♀.

Taxonomy: Smith, 1928. Ent. News 39: 242-243 (male). —Cole, 1940. Amer. Midland Nat. 24: 36. —Brown, 1958. Harvard Univ., Mus. Comp. Zool., Bul. 118: 243, 246, 247-248, 336 (also biological notes).

- Biology: Dennis, 1938. Ent. Soc. Amer., Ann. 31: 276, 304. —Wesson and Wesson, 1940. Amer. Midland Nat. 24: 90-91 (ate only inside of gaster of dead workers of other ants.)
- silaceum* Roger. Mass., s. Ont. (Peelee Is. and vicinity) s. to n. Fla., w. to Ill., Ark., Okla.  
*Proceratium silaceum* Roger, 1863. Berlin. Ent. Ztschr. 7: 172. ♀.  
*Proceratium crassicornae* Emery, 1895. Zool. Jahrb., Abt. f. System. 8: 265. ♀.  
*Proceratium crassicornae* var. *vestitum* Emery, 1895. Zool. Jahrb., Abt. f. System. 8: 266. ♀.  
*Proceratium silaceum rugulosum* Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34: 390. ♀, ♀.
- Taxonomy: Wheeler and Wheeler, 1952. Amer. Midland Nat. 48: 137 (larva). —Brown, 1958. Harvard Univ., Mus. Comp. Zool., Bul. 118: 241, 245-248, 336 (also biology).
- Biology: Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21: 373, 375. —Wheeler, 1916. Ind. Acad. Sci., Proc. 26: 460. —Smith, 1928. Ent. News 29: 244. —Dennis, 1938. Ent. Soc. Amer., Ann. 31: 272, 273, 276, 304. —Wesson and Wesson, 1940. Amer. Midland Nat. 24: 91.
- Morphology: Kennedy and Talbot, 1939. Ind. Acad. Sci., Proc. 48: 206-210 (each caste; also biological notes).

### Genus DISCOTHYREA Roger

*Discothyrea* Roger, 1863. Berlin. Ent. Ztschr. 7: 176.

Type-species: *Discothyrea testacea* Roger. Monotypic.

*Pseudosysphincta* Arnold, 1916. South. Afr. Mus., Ann. 14: 161.

Type-species: *Pseudosysphincta poweri* Arnold. Orig. desig.

*Prodiscothyrea* Wheeler, 1916. Roy. Soc. South. Aust., Trans. 60: 33.

Type-species: *Prodiscothyrea velutina* Wheeler. Monotypic.

*Pseudosysphincta* Wheeler, 1922. Amer. Mus. Nat. Hist., Bul. 45: 645, 762. Variant spelling of *Pseudosysphincta*.

Most of the 26 species of this genus are found in the tropical and southern temperate regions of the world. Because of their small size and cryptobiotic habits, they are not commonly collected and their biology is poorly known. The colonies are small and a number of forms have been collected from leaf litter, humus, and rotten logs.

Revision: Brown, 1958. Harvard Univ., Mus. Comp. Zool., Bul. 118: 248-253.

Taxonomy: Borgmeier, 1949. Rev. Brasil. Biol. 9: 205. —Borgmeier, 1957. Acad. Brasil. de Cien., An. 29: 124-125 (male). —Wheeler and Wheeler, 1971. Ent. Soc. Amer., Ann. 64: 1202 (larvae).

Biology: Brown, 1958. Psyche 64: 115 (as predators of eggs of other arthropods).

*testacea* Roger. N. C. to Fla.; Okla. Ecology: Some have been found in pine forest litter and in soil.

*Discothyrea testacea* Roger, 1863. Berlin. Ent. Ztschr. 7: 177. ♀, ♀.

Taxonomy: Weber, 1939. Ent. Soc. Amer., Ann. 32: 99 (worker, female). —Smith and Wing, 1954. N. Y. Ent. Soc., Jour. 62: 110-112 (worker, female). —Smith, 1955. Brooklyn Ent. Soc., Bul. 50: 98 (probable type locality; collector). —Brown, 1958. Harvard Univ., Mus. Comp. Zool., Bul. 118: 253, 341-342.

### TRIBE PONERINI

Taxonomy: Brown, 1963. Breviora 190: 1-10.

### Genus PACHYCONDYLA Smith

*Pachycondyla* Smith, 1858. Cat. Hym. Brit. Mus., v. 6, p. 105.

Type-species: *Formica crassinoda* Latreille. Desig. by Emery, 1901.

*Neoponera* Emery, 1901. Soc. Ent. Belg., Ann. 45: 40, 43.

Type-species: *Formica villosa* Fabricius. Orig. desig.

*Euponera* subg. *Trachymesopus* Emery, 1911. In Wytsman, Gen. Ins., fasc. 118, p. 84.

Type-species: *Formica stigma* Fabricius. Orig. desig.

Brown (1973) has synonymized *Neoponera*, *Trachymesopus*, and several other genera with *Pachycondyla*. This is a large genus in the tropical regions of the world, but only three species reach the United States.

Revision: Emery, 1890. Soc. Ent. France, Ann. 10: 71-74 (*Pachycondyla*).

Taxonomy: Wilson, 1958. Harvard Univ., Mus. Comp. Zool., Bul. 119: 352 (*Trachymesopus* not a subgenus of *Euponera*). —Kempf, 1960. Studia Ent. 3: 423-428 (New World species of *Trachymesopus*). —Kempf, 1961. Rev. Brasil. Ent. 10: 89-204 (Brazilian species of *Pachycondyla*). —Brown, 1963. Breviora 190: 6-8 (three species groups of *Trachymesopus*). —Kempf, 1964. Studia Ent. 7: 49-52 (key to species of *Pachycondyla*). —Brown, 1973. In Meggers, et al., Tropical forest ecosystems in Africa and S. Amer., pp. 178-185 (generic synonymy).

**harpax** (Fabricius). La. Tex. s. to Brazil; W. Indies. Ecology: Colonies of about 150 individuals are found in rotten logs and stumps or in soil beneath objects. Workers avoid direct sunlight and forage in the morning and in shade for other insects and myriapods on which they feed. There are both ergatoid and normal females.

*Formica harpax* Fabricius, 1804. Systema Piezatorum, p. 401. ♀.

*Pachycondyla Montezumia* Smith, 1858. Cat. Hym. Brit. Mus., v. 6, p. 108. ♀, ♂.

*Pomera* (!) *amplinoda* Buckley, 1866. Ent. Soc. Phila., Proc. 6: 171. ♀.

*Pachycondyla Orizabana* Norton, 1868. Amer. Nat. 2: 64. ♀.

*Pachycondyla harpax* var. *dibullana* Forel, 1901. Rev. Suisse Zool. 9: 347. ♀.

*Pachycondyla harpax* var. *irina* Wheeler, 1925. Arkiv for Zool. 17A: 5. ♀.

*Pachycondyla harpax* var. *concinna* Wheeler, 1925. Arkiv for Zool. 17A: 5. ♀, ♀.

Taxonomy: Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24: 401-403 (each caste). —Brown, 1950. Wasmann Jour. Biol. 8: 247-248 (species synonymy). —Wheeler and Wheeler, 1952. Amer. Midland Nat. 48: 617-618 (larva). —Kempf, 1961. Rev. Brasil. Ent. 10: 194.

Biology: Wheeler, 1900. Biol. Bul. 2: 1-31. —Haskins and Enzmann, 1938. N. Y. Acad. Sci., Ann. 37: 150-151 (formation of new colony; in Canal Zone).

**stigma** (Fabricius). Fla.; W. Indies, Mexico s. to n. Argentina; S. China to Samoa, n.

Queensland. Ecology: They prefer to nest in moist, dead logs or stumps, occasionally under stones. Apparently a tramp species distributed by commerce outside the New World. Whether or not it is endemic or adventive to Florida is unknown.

*Formica stigma* Fabricius, 1804. Systema Piezatorum, p. 400. ♀.

*Ponera quadridentata* Smith, 1859. Linn. Soc. London, Jour. Zool. 3: 143. ♀.

*Ponera Americana* Mayr, 1862. Zool.-Bot. Gesell. Wien, Verh. 13: 722. ♀.

*Euponera* (*Trachymesopus*) *nixonii* Donisthorpe, 1943. Ann. and Mag. Nat. Hist., ser. 11, 10: 441. ♀.

*Euponera* (*Trachymesopus*) *brunneus* Donisthorpe, 1947. Ann. and Mag. Nat. Hist., ser. 11, 14: 300-301. ♀, ♀.

*Euponera* (*Trachymesopus*) *sexdentatus* Donisthorpe, 1949. Ann. and Mag. Nat. Hist., ser. 12, 1: 746. ♀.

Taxonomy: Smith, 1934. Ent. Soc. Amer., Ann. 27: 561-564. —Wheeler and Wheeler, 1952. Amer. Midland Nat. 48: 627 (larva). —Wilson, 1958. Harvard Univ., Mus. Comp. Zool., Bul. 119: 355 (synonymy and distribution). —Wilson and Taylor, 1967. Pacific Ins. Monog. 14: 22 (Polynesia). —Wheeler and Wheeler, 1976. Amer. Ent. Soc., Trans. 102: 55-58 (descriptions of larvae from different localities; as *Mesoponera stigma*).

Biology: Smith, 1936. Puerto Rico Univ., Jour. Agr. 20: 824. —Haskins and Enzmann, 1938. N. Y. Acad. Sci., Ann. 37: 151 (colony formation; Canal Zone). —Kempf, 1960. Studia Ent. 3: 427-428. —Wilson, 1959. Evolution 13: 128 (distribution; ecology).

**villosa** (Fabricius). S. Tex. (as far north as San Antonio) s. to n. Argentina. Ecology: Colonies occur in the soil and in logs and stumps. Workers run rapidly in the bright sun in search of insects on which they feed. They can sting severely. The largest ponerine ant in the U. S.

*Formica villosa* Fabricius, 1804. Systema Piezatorum, p. 409. ♀.

*Ponera bicolor* Guérin, 1845. Iconogr. Regne Anim., Ins., v. 7, p. 242. ♀.

*Ponera pilosa* Smith, 1858. Cat. Hym. Brit. Mus., v. 6, p. 95. ♂.



*Ponera pedunculata* Smith, 1858. Cat. Hym. Brit. Mus., v. 6, p. 96. ♀.

Taxonomy: Roger, 1861. Berlin Ent. Ztschr. 5: 1 (worker, male). —Wheeler and Wheeler, 1952. Amer. Midland Nat. 48: 615 (larva). —Wheeler and Wheeler, 1971. Ent. Soc. Amer., Ann. 64: 1205 (larva).

Biology: Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24: 404.

### Genus BRACHYPONERA Emery

*Euponera* subg. *Brachyponera* Emery, 1901. Soc. Ent. Belg., Ann. 45: 43.

Type-species: *Ponera senaarensis* Mayr. Orig. desig.

A small genus found in the Old World. The one species in North America is adventive.

Taxonomy: Wilson, 1958. Harvard Univ., Mus. Comp. Zool., Bul. 119: 346 (not a subgenus of *Euponera*). —Brown, 1958. Acta Hym. 1: 21.

**solitaria** (Smith). Va., N. C., Ga.; Japan, China, and adjacent areas. Ecology: The small colonies are found in moist, rotten wood or in soil beneath objects; they prefer dark, damp places. Food consists of small arthropods. Accidentally introduced into N. Amer.

*Ponera solitaria* Smith, 1874. Ent. Soc. London, Trans., p. 404. ♀.

Taxonomy: Smith, 1934. Ent. Soc. Amer., Ann. 27: 558-561 (description; first record for N. Amer.). —Wheeler and Wheeler, 1952. Amer. Midland Nat. 49: 629 (larva). —Wheeler and Wheeler, 1971. Ent. Soc. Amer., Ann. 64: 1207 (larva).

Biology: Smith, 1934. Ent. Soc. Amer., Ann. 27: 560-561.

### Genus CRYPTOPONE Emery

*Cryptopone* Emery, 1892. Soc. Ent. France, Bul. 61: CCLXXV.

Type-species: *Amblyopone? testacea* Motschulsky. Monotypic.

Most species of this genus are found in Southeast Asia and vicinity; only one, apparently endemic species occurs in the United States.

Taxonomy: Wilson, 1958. Harvard Univ., Mus. Comp. Zool., Bul. 119: 357-361. —Brown, 1963. Breviora 190: 6.

**gilva** (Roger). Ga., Tenn., Ala., Miss., Ark., La., Tex. Ecology: The small colonies nest in moist dead logs or stumps, preferring loose frass under bark.

*Ponera gilva* Roger, 1863. Berlin Ent. Ztschr. 7: 170. ♀.

*Euponera (Trachymesopus) gilva harnedi* Smith, 1929. Ent. Soc. Amer., Ann. 22: 543. ♀.

Taxonomy: Smith, 1934. Ent. Soc. Amer., Ann. 27: 561-563. —Creighton and Tulloch, 1930. Psyche 37: 73-79 (each caste). —Wheeler and Wheeler, 1952. Amer. Midland Nat. 48: 625-627 (larva). —Brown, 1963. Breviora 190: 6.

Biology: Haskins, 1931. N. Y. Ent. Soc., Jour. 39: 507-521. —Dennis, 1938. Ent. Soc. Amer., Ann. 31: 277, 304.

### Genus PONERA Latreille

*Ponera* Latreille, 1804. Nouv. Dict. Hist. Nat. 24: 179.

Type-species: *Formica contracta* Latreille. Desig. by Latreille, 1805.

*Pseudocryptopone* Wheeler, 1933. Amer. Mus. Novitates 672: 12-13.

Type-species: *Cryptopone tenuis* Emery. Orig. desig.

*Selenopone* Wheeler, 1933. Amer. Mus. Novitates 672: 19.

Type-species: *Ponera selenophora* Emery. Orig. desig.

Taylor (1967) treated 28 world species and divided the genus into several species groups. Most species are found in the Indo-Australian area. The only two New World species are North American. Most forms are found in forested areas where they nest in small colonies in rotten wood or stumps or in the soil beneath cover. The workers are carnivorous.

Revision: Smith, 1936. Ent. Soc. Amer., Ann. 29: 420-430 (in part; U. S.). —Taylor, 1967.

Pacific Ins. Monog. 13: 1-112 (world).

Taxonomy: Wilson, 1957. Harvard Univ., Mus. Comp. Zool., Bul. 116: 356-357. —Brown, 1958. Acta Hym. 1: 22-23. —Wheeler and Wheeler, 1971. Ent. Soc. Amer., Ann. 64: 1208 (larvae).

## SPECIES GROUP LEAE

*exotica* Smith. N. C., Okla. Ecology: Specimens are all from Berlese samples of leaf litter or leaf mold. Possibly introduced. Affinities are with the Indo-Australian fauna.

*Ponera exotica* Smith, 1962. Acta Hym. 1: 378-382. ♀, ♀.

Taxonomy: Taylor, 1967. Pacific Ins. Monog. 13: 96-97.

## SPECIES GROUP COARCTATA

*pennsylvanica* Buckley. N. S., Que. s. to Fla. w. to Ont., N. Dak., Colo., Utah, N. Mex. Ecology: Most abundant in the eastern deciduous forests, east of the 97th meridian, with only scattered records in the western states. Nests are found under rotting logs, in rotting stumps, small fragments of wood, acorns and other objects, or in soil or leaf mold. In drier habitats they may nest under stones. Workers forage in or on the ground and are carnivorous. Only occasionally a household pest.

*Ponera Pennsylvanica* Buckley, 1866. Ent. Soc. Phila., Proc. 6: 171. ♀.

Taxonomy: Wheeler and Wheeler, 1952. Amer. Midland Nat. 48: 631 (larva). —Taylor, 1967. Pacific Ins. Monog. 13: 29-38 (also biology, ecology). —Wheeler and Wheeler, 1971. Ent. Soc. Amer., Ann. 64: 1210 (larva).

Biology: Wheeler, 1900. Biol. Bul. 2: 22-23, 43-56. —Wheeler, 1917. Conn. State Geol. and Nat. Hist. Survey Bul. 22: 581. —Haskins and Enzmann, 1938. N. Y. Acad. Sci., Ann. 37: 152-155 (colony formation). —Headley, 1952. Ent. Soc. Amer., Ann. 45: 436-438. —Kannowski, 1959. Insectes Sociaux 6: 118 (colony founding). —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 91-92. —Gregg, 1963. Ants of Colo., pp. 281-282, 284.

Morphology: Gotwald, 1969. N. Y. Agr. Expt. Sta. (Cornell Univ.) Mem. 408: 25-42 (mouthparts).

## Genus HYPOPONERA Santschi

*Ponera* subg. *Hypoponera* Santschi, 1938. Soc. Ent. France, Bul. 43: 79.

Type-species: *Ponera abeillei* Andre. Orig. desig.

A large cosmopolitan genus whose habits are similar to those of species of *Ponera*. Prior to Taylor, 1967, the species below were assigned to the genus *Ponera*.

Revision: Smith, 1936. Ent. Soc. Amer., Ann. 29: 420-430 (in part, as *Ponera*; U. S.).

Taxonomy: Taylor, 1967. Pacific Ins. Monog. 13: 9-14 (a distinct genus). —Taylor, 1968. Ent. News 79: 63-66 (list of N. Amer. species). —Wheeler and Wheeler, 1971. Ent. Soc. Amer., Ann. 64: 1210 (larvae).

*gleadowi* (Forel). Md. (Priest Bridge); Asia. Apparently a widespread tramp species. Possibly introduced. No other confirmed records from the U. S.

*Ponera Gleadowi* Forel, 1895. R. Accad. Sci. Bologna, Mem. 5: 292-293. ♀.

*Ponera japonica formosae* Forel, 1913. Arch. f. Naturgesch. 79: 186.

*Ponera oblongiceps* Smith, 1939. Ent. Soc. Wash., Proc. 41: 76-78. ♀, ♀, apterous ergatoid ♂.

Taxonomy: Wilson, 1958. Harvard Univ., Mus. Comp. Zool., Bul. 119: 326 (Melanesia; provisional synonymy). —Taylor, 1967. Pacific Ins. Monog. 13: 11, 12, 76. —Wilson and Taylor, 1967. Pacific Ins. Monog. 14: 29 (unknown from Polynesia; synonymy given for *gleadowi* by Wilson, 1958 provisionally transferred to synonymy of *punctatissima* (Roger)). —Taylor, 1968. Ent. News 79: 65 (U. S.).

*inexorata* (Wheeler). S. C. to Fla. w. to Tex., Ariz.; s. to Central Amer.

*Ponera inexorata* Wheeler, 1903. Psyche 10: 94. ♀, ♀.

Taxonomy: Taylor, 1968. Ent. News 79: 65.

Biology: Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24: 406.

**opaciceps** (Mayr). S. C. to Fla. w. to Colo., Ariz.; s. to Argentina, W. Indies; s. e. Asia, Polynesia. Probably spread from New World to Old World by commerce.

*Ponera opaciceps* Mayr, 1887. Zool.-Bot. Gesell. Wien, Verh. 37: 536. ♀.

*Ponera perkinsi* Forel, 1899. Fauna Hawaiensis, p. 117. ♀, ♀, ♂.

*Ponera andrei* Emery, 1900. Termes. Fuzetek 23: 318. ♀.

Taxonomy: Smith, 1929. Ent. Soc. Amer., Ann. 22: 545-546. —Smith and Haug, 1931. Ent. Soc. Amer., Ann. 24: 507-509 (ergatandrous form). —Wheeler and Wheeler, 1952. Amer. Midland Nat. 48: 364 (larva). —Kempf, 1962. Studia Ent. 5: 7-9. —Wilson and Taylor, 1967. Pacific Ins. Monog. 14: 28 (Polynesia). —Taylor, 1968. Ent. News 79: 65. —Wheeler and Wheeler, 1971. Ent. Soc. Amer., Ann. 64: 1210 (larva).

Biology: Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24: 125, 404. —Smith, 1927. Ent. News 38: 308-309. —Kempf, 1960. Studia Ent. 3: 391. —Gregg, 1963. Ants of Colo., pp. 283-284.

**opacior** (Forel). Va. to Fla. w. to Ohio, Iowa, Colo., Tex.; Oreg., Calif.; Mexico s. to Chile, Argentina; W. Indies. More sporadically distributed west of Tex. than in eastern states.

*Ponera trigona* var. *opacior* Forel, 1893. Ent. Soc. London, Trans., p. 363. ♀, ♀.

Taxonomy: Taylor, 1968. Ent. News 79: 65.

Biology: Dennis, 1938. Ent. Soc. Amer., Ann. 31: 272, 274, 277, 304 (Tenn.). —Cole, 1940. Amer. Midland Nat. 24: 37 (Smoky Mts.). —Mallis, 1941. South. Calif. Acad. Sci., Bul. 40: 63 (Calif.). —Potts, 1948. Pan-Pacific Ent. 24: 26 (Calif.). —Gregg, 1963. Ants of Colo., pp. 284-286.

**punctatissima** (Roger). Fla., Tex., N. Mex., Ariz., Calif.; s. to Central Amer., W. Indies; Europe, N. Africa. Ecology: Nearly cosmopolitan in warmer parts of world. Possibly introduced; probably of African origin.

*Ponera punctatissima* Roger, 1859. Berlin. Ent. Ztschr. 3: 246-248. ♀, ♀.

*Ponera androgyna* Roger, 1859. Berlin. Ent. Ztschr. 3: 254. Ergatoid ♂.

*Ponera ergatandria* Forel, 1893. Ent. Soc. London, Trans., p. 365. ♀, ♀, apterous ergatoid ♂.

*Ponera punctatissima schauinslandi* Emery, 1899. Zool. Jahrb., Abt. f. System 12: 439. ♀.

Taxonomy: Smith, 1936. Ent. Soc. Amer., Ann. 29: 422, 425-426 (female, worker, apterous ergatoid male). —Wilson and Taylor, 1967. Pacific Ins. Monog. 14: 28-29 (Polynesia; synonymy under *gleadowi* (Forel) listed by Wilson, 1958, Harvard Univ., Mus. Comp. Zool., Bul. 119: 328-329 provisionally transferred to *punctatissima*. This synonymy is not listed above). —Taylor, 1968. Ent. News 79: 65.

Biology: Smith, 1936. Puerto Rico Univ., Jour. Agr. 20: 825. —Mallis, 1941. South. Calif. Acad. Sci., Bul. 40: 63.

### Genus LEPTOGENYS Roger

Only a single species of this tropicopolitan genus is known to occur in the United States.

Taxonomy: Wheeler and Wheeler, 1976. Amer. Ent. Soc., Trans. 102: 49 (revised characterization of larvae).

#### Genus LEPTOGENYS Subgenus LEPTOGENYS Roger

*Leptogenys* Roger, 1861. Berlin. Ent. Ztschr. 5: 41.

Type-species: *Leptogenys falcigera* Roger. Desig. by Bingham, 1903.

*Dorylozelus* Forel, 1915. Arkiv for Zool. 9: 24-25.

Type-species: *Dorylozelus joeborgi* Forel. Monotypic.

*Microbolbos* Donisthorpe, 1948. Entomologist 81: 170.

Type-species: *Microbolbos testaceus* Donisthorpe. Orig. desig.

Not known to occur in the Nearctic Region.

#### Genus LEPTOGENYS Subgenus LOBOPELTA Mayr

*Lobopelta* Mayr, 1862. Zool.-Bot. Gesell. Wien, Verh. 12: 733.

Type-species: *Ponera diminuta* Smith. Desig. by Bingham, 1903.

Revision: Wheeler, 1923. Amer. Mus. Novitates 90: 1-16.

*elongata elongata* (Buckley). La., Tex. Ecology: The small colonies are found in the soil. The workers apparently forage singly and feed largely, if not exclusively, on pillbugs. There is no typical female as with most ants, reproduction being carried on by a wingless, slightly modified worker form with an enlarged gaster.

*Ponera Texana* Buckley, 1866. Ent. Soc. Phila., Proc. 6: 170. ♀. A questionable synonym.

*Ponera elongata* Buckley, 1866. Ent. Soc. Phila., Proc. 6: 172. ♀.

*Lobopelta septentrionalis* Mayr, 1866. Zool.-Bot. Gesell. Wien, Verh. 36: 438. ♀.

Taxonomy: Wheeler, 1904. Biol. Bul. 6: 257-259 (worker, gynaecoid female, male). —Wheeler and Wheeler, 1952. Amer. Midland Nat. 48: 641 (larva). —Wheeler, 1900. Biol. Bul. 2: 1-31.

Morphology: Hermann, 1969. Kans. Ent. Soc., Jour. 42: 239-243 (poison apparatus).

*elongata manni* Wheeler. Fla.

*Leptogenys (Lobopelta) elongata manni* Wheeler, 1923. Amer. Mus. Novitates 90: 14-15. ♀.

#### TRIBE ODONTOMACHINI

##### Genus ODONTOMACHUS Latreille

*Odontomachus* Latreille, 1804. Nouv. Dict. Hist. Nat. 24: 179.

Type-species: *Formica haematoda* Linnaeus. Monotypic.

Four forms of this tropicopolitan genus reach the southern portions of the United States. All of these have previously been considered as subspecies of the Neotropical *O. haematodus* (L.). Most colonies are small and are found in soil or in rotting logs and stumps. Workers are predaceous and carnivorous. Species of this genus have elongated, linear mandibles and long hairs which arise between the bases of the mandibles and point forward. These hairs act as triggers when the mandibles are open. When the hairs are touched, the mandibles snap shut resulting in a clicking sound. If the mandibles close suddenly on a small object, the object may be cut in two; if they close suddenly on a large object and the mandibles slide over it, the ant is thrown in a series of leaps by the force of its closing mandibles.

Revision: Smith, 1939. N. Y. Ent. Soc., Jour. 47: 125-130 (U. S.).

Taxonomy: Wheeler and Wheeler, 1952. Amer. Midland Nat. 48: 646 (larvae). —Wheeler and Wheeler, 1964. Ent. Soc. Amér., Ann. 57: 455-456 (larvae). —Wheeler and Wheeler, 1971. Ent. Soc. Amer., Ann. 64: 1212 (larvae). —Wheeler and Wheeler, 1976. Amer. Ent. Soc., Trans. 102: 61 (revised characterization of larvae).

Biology: Wheeler, 1900. Biol. Bul. 2: 1-31. —Wheeler, 1922. Amer. Mus. Nat. Hist., Bul. 45: 99-103. —Weyer, 1930. Zool. Anz. 90: 49-55 (leaping habits).

Morphology: Eisner, 1957. Harvard Univ., Mus. Comp. Zool., Bul. 116: 475-476 (proventriculus).

*clarus* Roger. La., Tex.; Mexico, Clarion Is., W. Indies. Ecology: Found in semi-desert regions where colonies occur in coarse, gravelly soil, fully exposed to the sun.

*Odontomachus clarus* Roger, 1861. Berlin. Ent. Ztschr. 5: 26. ♀.

*Odontomachus texana* Buckley, 1867. Ent. Soc. Phila., Proc. 6: 355. ♀.

*Odontomachus haematoda clarionensis* Wheeler, 1934. Pan-Pacific Ent. 10: 141. ♀.

Taxonomy: Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24: 407 (worker, female, male). —Wheeler and Wheeler, 1952. Amer. Midland Nat. 48: 648-650 (larva). —Taylor and Wilson, 1961. Psyche 68: 142.

Biology: Wheeler, 1900. Biol. Bul. 2: 1-31. —Haskins and Enzmann, 1938. N. Y. Acad. Sci., Ann. 37: 100-143.

*coninodis* Wheeler. Ariz. (Huachuca Mtns.). Ecology: Small colonies are in coarse gravelly soil under stones at high elevations, usually over 5000 ft.

*Odontomachus haematoda coninodis* Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34: 391.

♂, ♀.

**desertorum** Wheeler. N. Mex., Ariz.; Mexico. Ecology: Small colonies are in coarse gravelly soil under stones. Found at lower elevations than *coninodis*.

*Odontomachus haematoda desertorum* Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34: 391. ♀.

Biology: Cole, 1934. Ent. Soc. Amer., Ann. 27: 394.

**insularis** Guerin. Ga., Fla., Ala.; Mexico to Brazil, W. Indies, Cocos Is., Clipperton Is. Ecology: Colonies may be in soil or in rotting logs and stumps. Possibly adventive in the U. S., distributed by commerce.

*Odontomachus insularis* Guerin, 1844. Iconogr. Regne Anim. Ins., v. 7, p. 423. ♀.

Taxonomy: Roger, 1861. Berlin. Ent. Ztschr. 5: 26 (worker, male). —Taylor and Wilson, 1961. Psyche 68: 142 (distribution).

Biology: Haskins and Enzmann, 1938. N. Y. Acad. Sci., Ann. 37: 149 (formation of new colonies).

#### SUBFAMILY PSEUDOMYRMECINAE

A small subfamily with one genus in the New World and several genera in the Old World tropics. M. R. Smith (1951) named this subfamily Leptaleinae based on the genus *Leptalea* Erichson, but later (1952) found an earlier valid generic name, *Pseudomyrmex* Lund, and changed the subfamily name to Pseudomyrmecinae which has become widely established.

Taxonomy: Smith, 1951. U. S. Dept. Agr., Agr. Monogr. 2: 788 (Leptaleinae). —Smith, 1952. Ent. Soc. Wash., Proc. 54: 97-98 (Pseudomyrmecinae). —Wheeler and Wheeler, 1973. Psyche 80: 204-211 (larvae).

#### Genus PSEUDOMYRMEX Lund

*Pseudomyrme* Lund, 1831 (June). Ann. Sci. Nat. Zool. 23: 137. Latreille ms.; vernacular.

*Pseudomyrmex* Lund, 1831 (November). Notizen aus dem Gebiete der Natur und Heilkunde 32(7): 106. Latreille ms.

Type-species: *Formica gracilis* Fabricius. Desig. by Smith, 1952.

*Leptalea* Erichson, 1839. Arch. f. Naturgesch. 5: 309. Klug ms.

Type-species: *Formica gracilis* Fabricius. Desig. by Wheeler, 1911.

*Myrmex* Guerin, 1844. Iconogr. Regne Anim., Ins., v. 7, p. 427. Preocc. by Sturm, 1826.

Type-species: *Formica (Myrmex) perbosci* Guerin. Monotypic.

*Pseudomyrma* Guerin, 1844. Iconogr. Regne Anim., Ins., v. 7, p. 427. emend.

*Leptalea* Spinola, 1851. Accad. Sci. Torino, Mem. 13: 68. Emend.

Over 190 forms of *Pseudomyrmex* have been described, but only five reach the southern portions of the United States. These ants prefer to nest almost exclusively in preformed plant cavities such as twigs and branches of trees, stems of plants, acacia thorns, and in culms of sedges and grasses. Some species may be restricted to one species of plant or even to one part of the plant. Among these are the acacia nesting species which nest in the swollen bases of the larger spines. Janzen (1967) studied a case of obligatory mutualism between a species of *Pseudomyrmex* and *Acacia* in Mexico and found that the ant is dependent on the acacia for food and the acacia is dependent on the ant for a substantial part of its life in order to produce seeds and become part of the reproductive population. The ant colony protects the plant from damaging factors such as defoliators and thereby assures its own survival on the plant which is its only food source.

Revision: Mayr, 1870. Akad. der Wiss. Wien, Math.-Nat. Kl. Sitzber. 61: 406-413.

Taxonomy: Smith, 1952. Ent. Soc. Wash., Proc. 54: 97-98 (correct generic name). —Creighton, 1955. N. Y. Ent. Soc., Jour. 63: 19-20 (key to workers of U. S.). —Wheeler and Wheeler, 1956. Ent. Soc. Amer., Ann. 49: 376-379 (larvae). —Kempf, 1958. Studia Ent. (n. s.) 1: 434 (*gracilis* (Fabricius) group).

Biology: Wheeler, 1913. 2nd Internat. Cong. Ent., Oxford, Trans. 2: 109-139 (observations on Central American *Acacia* ants). —Wheeler and Bailey, 1920. Amer. Phil. Soc., Trans. (n. s.) 22: 235-279 (feeding habits). —Brown, 1960. Ecology 41: 589-592 (ants, acacias and

browsing mammals). —Janzen, 1966. *Evolution* 20: 249-275 (coevolution of mutualism between ants and acacias in Central America). —Janzen, 1967. *Kans. Univ., Sci. Bul.* 48: 315-558 (interaction of the bull's-horn acacia with an ant inhabitant (*Pseudomyrmex ferruginea* Smith) in eastern Mexico). —Janzen, 1967. *Ecology* 48: 26-35 (fire, vegetation structure and the ant acacia interaction in Central America). —Janzen, 1969. *The Condor* 71: 240-256 (the ant acacia interaction and birds in Central America).

Morphology: Eisner, 1957. *Harvard Univ., Mus. Comp. Zool., Bul.* 116: 452-453 (proventriculus). —Gotwald, 1969. *N. Y. Agr. Expt. Sta (Cornell Univ.), Mem.* 408: 128 (mouthparts).

**apache** Creighton. S. Tex., s. N. Mex., s. Ariz., s. Calif.; n. Mexico. Ecology: Most colonies have been found in sizeable limbs or trunks of species of *Quercus* and *Prosopis*.

*Pseudomyrmex apache* Creighton, 1952. *Psyche* 59: 134-139. ♀, ♀, ♂.

Taxonomy: Wheeler and Wheeler, 1956. *Ent. Soc. Amer., Ann.* 49: 380 (larva).

Biology: Creighton, 1954. *Psyche* 61: 9-15. —Creighton, 1963. *Amer. Mus. Novitates* 2156: 1-4 (high mortality during cold snap).

**brunneus** (Smith). N. C. to Fla. w. to Tex. s. to Central Amer.; W. Indies. Ecology: Colonies have been found in dead twigs of various plants and in culms of grasses and sedges.

*Pseudomyrma brunnea* Smith, 1877. *Ent. Soc. London, Trans.*, p. 63. ♀.

Taxonomy: Wheeler, 1908. *Amer. Mus. Nat. Hist., Bul.* 24: 420-421. —Wheeler and Wheeler, 1956. *Ent. Soc. Amer., Ann.* 49: 382 (larva).

Biology: Mitchell and Pierce, 1912. *Ent. Soc. Wash., Proc.* 14: 69. —Wheeler, 1932. *N. Y. Ent. Soc., Jour.* 40: 3.

**elongatus** (Mayr). Fla., Tex. s. to S. Amer.; W. Indies. Ecology: Colonies have been found in twigs of trees and in culms of grasses and sedges.

*Pseudomyrma elongata* Mayr, 1870. *Akad. der Wiss. Wien, Math.-Nat. Kl. Sitzber.* 61: 408, 413. ♀.

*Pseudomyrma elongata* var. *cubaensis* Forel, 1901. *Soc. Ent. Belg., Ann.* 45: 342 ♀.

*Pseudomyrma elongata* var. *tandem* Forel, 1906. *Soc. Ent. Belg., Ann.* 50: 228. ♀.

Taxonomy: Wheeler, 1905. *Amer. Mus. Nat. Hist., Bul.* 21: 85-87 (each caste). —Creighton, 1955. *N. Y. Ent. Soc., Jour.* 63: 17-20. —Wheeler and Wheeler, 1956. *Ent. Soc. Amer., Ann.* 49: 384 (larva).

Biology: Wheeler, 1932. *N. Y. Ent. Soc., Jour.* 40: 4.

**gracilis mexicanus** (Roger). Fla., Tex. s. to Central Amer. Ecology: Colonies have been found in dead limbs of live oaks, in live oak twig galls, in shrubs, hollow stems of composites, and cavities in other plants. Probably accidentally introduced into Florida. *P. gracilis gracilis* (Fabricius) is found in Central and S. Amer.

*Pseudomyrma mexicana* Roger, 1863. *Berlin. Ent. Ztschr.* 7: 178. ♀.

Taxonomy: Wheeler, 1908. *Amer. Mus. Nat. Hist., Bul.* 24: 421 (worker, female). —Wheeler and Wheeler, 1956. *Ent. Soc. Amer., Ann.* 49: 385-386 (larva). —Brown, 1957. *Harvard Univ., Mus. Comp. Zool., Bul.* 116: 235.

Biology: Wheeler, 1901. *Soc. Ent. Belg., Ann.* 45: 204. —Mitchell and Pierce, 1912. *Ent. Soc. Wash., Proc.* 14: 69. —Whitcomb, Denmark, Buren, and Carroll, 1972. *Fla. Ent.* 55: 31-33 (in Florida).

**pallidus** (Smith). N. C. to Fla. w. to Ariz., Calif. s. to S. Amer.; W. Indies. Ecology: Colonies have been found in twigs and branches of various plants and in culms of grasses and sedges. Some of the early western records of this species may actually refer to *apache* Creighton. References to *P. flavidulus* (Smith) for the U. S. pertain to this species; *flavidulus* was described from S. Amer. and its correct status is not known (see Creighton, 1950).

*Pseudomyrma pallida* Smith, 1855. *Ent. Soc. London, Trans.*, 3: 160. ♀.

Taxonomy: Wheeler, 1908. *Amer. Mus. Nat. Hist., Bul.* 24: 419-420. —Wheeler, 1905. *Amer. Mus. Nat. Hist., Bul.* 21: 83-85 (each caste). —Creighton, 1950. *Harvard Univ., Mus. Comp. Zool., Bul.* 104: 80-82. —Wheeler and Wheeler, 1956. *Ent. Soc. Amer., Ann.* 49: 386 (larva).

Biology: Mitchell and Pierce, 1912. Ent. Soc. Wash., Proc. 14: 69. —Wheeler, 1932. N. Y. Ent. Soc., Jour. 40: 4.

Morphology: Blum and Callahan, 1963. Psyche 70: 69-74 (morphology and physiology of poison glands and venom).

#### UNPLACED TAXON OF PSEUDOMYRMECINAE

*Ponera (Ectatoma(!)) Lincecumii* Buckley, 1866. Ent. Soc. Phila., Proc. 6: 172. ♂. Cent. Tex.

#### SUBFAMILY MYRMICINAE

This is the largest subfamily of ants and is found throughout the world. In North America, the Myrmicinae are better represented in the central and southern United States with their incidence rapidly decreasing northwards where the Formicinae become the dominant subfamily. Members of this subfamily are recognized by the two-segmented petiole and the frontal carinae which are distant from each other and each of which usually bears a lobe concealing the antennal insertions.

Taxonomy: Wheeler and Wheeler, 1960. Ent. Soc. Amer., Ann. 53:98-110 (larvae). —Wheeler and Wheeler, 1960. Ent. Soc. Wash., Proc. 62:1-32 (larvae). —Ettershank, 1966. Austral. Jour. Zool. 14:73-171 (generic revision of world Myrmicinae related to *Solenopsis* and *Pheidologeton*). —Wheeler and Wheeler, 1973. Psyche 80: 204-211 (supp. studies on larvae). —Wheeler and Wheeler, 1973. Psyche 80: 70-82 (larvae of four tribes, 2nd supp.; Leptothoracini, Ocymyrmecini, Tetramoriini, Cryptocerini). —Wheeler and Wheeler, 1973. Ga. Ent. Soc., Jour. 8: 27-39 (larvae of six tribes, 2nd supp.).

Morphology: Blum, 1974. N. Y. Ent. Soc., Jour. 82: 141-147 (Myrmicine trail pheromones: specificity, source, and significance). —McCluskey, 1974. N. Y. Ent. Soc., Jour. 82: 93-102 (generic diversity in phase of rhythm in Myrmicine ants).

#### TRIBE MYRMICINI

##### Genus MYRMICA Latreille

*Myrmica* Latreille, 1804. Nouv. Dict. Hist. Nat. 24:179.

Type-species: *Formica rubra* Linnaeus. Desig. by Latreille, 1810.

This holarctic genus is found as far north as Labrador and Alaska in North America and is restricted to higher elevations in the southern parts of its range. There are apparently no sub-tropical or xerophilous representatives. The moderate sized colonies nest in soil, rotten wood, or under cover of various objects. Workers are carnivorous but also feed on honeydew of Homoptera and exudates of plants. Workers of some species differ from each other very slightly and males are sometimes needed for determination. Some species are closely related to Palearctic forms and have been regarded as subspecies of them by some authors.

Revision: Weber, 1947. Ent. Soc. Amer., Ann. 40:437-474. —Weber, 1948. Ent. Soc. Amer., Ann. 41:267-308. —Weber, 1950. Ent. Soc. Amer., Ann. 43:189-226.

Taxonomy: Wheeler, 1907. Wis. Nat. Hist. Soc., Bul. 5:73-83 (varieties of *M. brevinodis*). —Wheeler and Wheeler, 1952. Psyche 59:112-123 (larvae). —Yarrow, 1955. Roy. Ent. Soc. London, Proc., Ser. B: Taxonomy 24:113-115 (type-species). —Collingwood, 1958. Roy. Ent. Soc. London, Proc., Ser. A 33:65-75 (Britain). —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 94-108. —Collingwood, 1974. Soc. Brit. Ent., Trans. 16:96-101 (Britain).

Biology: Brian, 1957. Insectes Sociaux 4:177-190 (growth and development of colonies). —Weir, 1958. Insectes Sociaux 5:97-128, 316-339 (polyethism in workers). —Weir, 1958. Jour. Ins. Physiol. 1:352-360 (effect of temperature variation on queen oviposition and colony formation). —Kannowski, 1959. Insectes Sociaux 6:143-144 (flight activities and colony founding). —Weir, 1959. Insectes Sociaux 6:271-290 (influence of worker age on trophogenic larval dormancy). —Weir, 1959. Insectes Sociaux 6:167-201 (egg masses and early larval growth). —Weir, 1959. Physiol. Zool. 32:63-77 (interrelation of queen and worker oviposition). —Carr, 1962. Insectes Sociaux 9:177-211 (influence of queen). —Brian and Hibble, 1963. Insectes Sociaux 10:71-82 (larval size and influence of queen on growth).

- Kannowski, 1970. Ent. Soc. Amer., N. Central Branch, Proc. 25:119-125 (colony populations of 5 species).
- Morphology: Weir, 1957. Quart. Jour. Micros. Sci. 98:499-506 (functional anatomy of mid-gut of larvae). —Weir, 1959. Insectes Sociaux 6:375-386 (changes in the rectro-cerebral endocrine system of larvae and their relation to larval growth and development). —Crews and Blum, 1970. Ztschr. f. Vergleich. Physiol. 70:363-373 (alarm pheromones of 9 species).
- americana** Weber. Que., Maine s. to N. C., Tenn., w. to Man., Colo., Utah, Ariz. Ecology: More common on east slopes of Rocky Mtns.; records from west of the Rockies are rare. Commonly found in grasslands where nests are in soil in open or under objects; food is varied, consisting of animal matter and plant juices. Sometimes considered as a subspecies of the Palearctic *Myrmica sabuleti* Meinert.
- Myrmica sabuleti americana* Weber, 1939. Lloydia 2:144. ♀, ♂, ♂.
- Taxonomy: Wheeler and Wheeler, 1952. Psyche 59:116 (larva).
- Biology: Wheeler, 1916. Conn. State Geol. and Nat. Hist. Survey Bul. 22:587. —Buren, 1944. Iowa State Col., Jour. Sci. 18:282-283. —Kannowski, 1956. Amer. Midland Nat. 56:175. —Kannowski and Kannowski, 1957. Ohio Jour. Sci. 57:371-374 (mating activities). —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 96-99. —Gregg, 1963. Ants of Colo., pp. 308-310. —Ayre, 1963. Canad. Ent. 95:712-715 (feeding habits). —Burns, 1964. Ent. Soc. Amer., Ann. 57:138 (association with tuliptree scale). —Ayre, 1968. Canad. Ent. 100:165-172 (prey finding, capture, and transport). —Ayre, 1969. Canad. Ent. 101:118-128 (trail formation and group foraging). —Ayre, 1971. Ztschr. f. Angew. Ent. 68:295-299 (foraging and nesting habits).
- brevispinosa brevispinosa** Wheeler. N. Dak., Nebr. s. to Colo., N. Mex., w. to Alta., Idaho. Ecology: Prefers to nest in stream valleys or on shores of permanent bodies of water.
- Myrmica rubra brevinodis* var. *brevispinosa* Wheeler, 1907. Wis. Nat. Hist. Soc., Bul. 5:74. ♀, ♀, ♂.
- Myrmica rubra brevinodis* var. *decedens* Wheeler, 1907. Wis. Nat. Hist. Soc., Bul. 5:75. ♀, ♂.
- Taxonomy: Wheeler and Wheeler, 1952. Psyche 59:117 (larva). —Kannowski, 1956. Amer. Midland Nat. 56:176. —Gregg, 1961. N. Y. Ent. Soc., Jour. 69:211.
- Biology: Weber, 1942. Canad. Ent. 74:62. —Wheeler and Wheeler, 1944. N. Dak. Hist. Quart. 11:241. —Gregg, 1963. Ants of Colo., pp. 296-297, 299. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 101-103 (subspecies not recognized).
- brevispinosa discontinua** Weber. Newfoundland, N. S. w. to mtns. of Wyo., Colo., N. Mex. Ecology: Apparently more tolerant than the typical subspecies of higher altitudes in Rockies where the two subspecies overlap.
- Myrmica brevinodis discontinua* Weber, 1939. Lloydia 2:150. ♀.
- Biology: Cole, 1953. Tenn. Acad. Sci., Jour. 28:243 (N. Mex.). —Gregg, 1963. Ants of Colo., pp. 298-300.
- emeryana emeryana** Forel. Newfoundland s. to Ga., w. to Man., Idaho, Colo., Ariz. Ecology: Nests are usually in woodlands in moist, shady situations under stones or other objects. Sometimes considered as a subspecies of the Palearctic *M. schencki* Emery.
- Myrmica scabrinodis schencki* var. *emeryana* Forel, 1914. Deut. Ent. Ztschr., p. 617. ♀, ♀, ♂.
- Myrmica schencki latifrons* Starcke, 1927. Tijdschr. v. Ent. 70:84. ♀.
- Taxonomy: Wheeler and Wheeler, 1952. Psyche 59:114, 117 (larva). —Smith, 1954. Brooklyn Ent. Soc., Bul. 49:138-140 ♀, ♀ (worker, female; type - locality). —Wheeler and Wheeler, 1972. Ga. Ent. Soc., Jour. 7:233 (larva).
- Biology: Wheeler, 1915. Psyche 22:206. —Talbot, 1945. Ent. Soc. Amer., Ann. 38:365-372 (population studies). —Kannowski, 1959. Insectes Sociaux 6:121. —Medler, 1958. Ent. Soc. Wash., Proc. 60:258 (swarming). —Peterson and Davies, 1960. Canad. Jour. Zool. 38:15 (predation on *Simulium*; behavior). —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 103-104. —Gregg, 1963. Ants of Colo., pp. 311-312, 314.



- emeryana** *tahoensis* Wheeler. Mont., Wyo., Utah, Ariz. w. to B. C., Oreg., Nev., Calif. Ecology: Mostly in mountains at higher elevations.  
*Myrmica scabrinodis schencki* var. *tahoensis* Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52:504. ♀, ♀, ♂.
- Biology: Cole, 1966. Brigham Young Univ., Sci. Bul., Biol. Ser. 7 (3):3-4 (Nevada Test Site).
- hamulata** *hamulata* Weber. Colo., N. Mex., Utah, Ariz. Ecology: Apparently prefers to nest in upland plateaus from 7,000 to 8,000 ft.  
*Myrmica sabuleti hamulata* Weber, 1939. Lloydia 2:146. ♀, ♀, ♂.
- Biology: Gregg, 1963. Ants of Colo., pp. 300-301.
- hamulata** *trullicornis* Buren. Iowa. The exact status of this form will remain uncertain until a male can be associated with the workers.  
*Myrmica sabuleti trullicornis* Buren, 1944. Iowa State Col., Jour. Sci. 18:281. ♀, ♀.
- Taxonomy: Creighton, 1950. Harvard Univ., Mus. Comp. Zool. Bul. 104:99-100.
- incompleta** *incompleta* Provancher. Labrador s. to N. J., w. to Rocky Mtns., Colo., Utah, N. Mex. Ecology: Widely distributed with wide elevational tolerance. Prefers moist, grassy habitats where it usually nests under objects. Host of the inquiline *Leptothorax provancheri* Emery.  
*Myrmica incompleta* Provancher, 1881. Nat. Canad. 12:359. ♀, ♀, ♂.  
*Myrmica rubra brevinodis* Emery, 1895. Zool. Jahrb., Abt. f. System 8:312. ♀, ♂.  
*Myrmica rubra brevinodis* var. *canadensis* Wheeler, 1907. Wis. Nat. Hist. Soc., Bul. 5:76. ♀, ♀, ♂.  
*Myrmica rubra brevinodis* var. *subalpina* Wheeler, 1907. Wis. Nat. Hist. Soc., Bul. 5:77. ♀, ♀, ♂.
- Taxonomy: Wheeler and Wheeler, 1952. Psyche 59:116 (larva). —Francoeur and Beique, 1966. Canad. Ent. 98:141 (Provancher types).
- Biology: Wheeler, 1907. Wis. Nat. Hist. Soc., Bul. 5:73, 77-83. —Wheeler, 1916. Conn. State Geol. and Nat. Hist. Survey Bul. 22:587. —Kannowski, 1959. Insectes Sociaux 6:121, 155 (pleometrosis). —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 99-101. —Gregg, 1963. Ants of Colo., pp. 291-292, 294.
- incompleta** *kuschei* Wheeler. Alaska.  
*Myrmica brevinodis* var. *kuschei* Wheeler, 1917. Harvard Univ., Mus. Comp. Zool., Bul. 61:17. ♀, ♀.  
*Myrmica brevinodis* var. *alaskensis* Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52:503. ♀.
- incompleta** *sulcinodoides* Emery. S. Dak., Colo., N. Mex. w. to Alta., Alaska, B. C., Oreg., Calif. Some authors do not consider this a valid subspecies.  
*Myrmica rubra brevinodis* var. *sulcinodoides* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:313. ♀.  
*Myrmica rubra brevinodis* var. *frigida* Forel, 1902. Ent. Soc. London, Trans., p. 699. ♀.  
*Myrmica rubra brevinodis* var. *whymperi* Forel, 1904. Soc. Ent. Belg., Ann. 48:154. ♀.
- Biology: Wheeler, 1915. Psyche 22:206. —Cole, 1934. Psyche 41:223. —Gregg, 1963. Ants of Colo., pp. 293-295, 297.
- lampira** Francoeur. Que. (Parc des Laurentides). Ecology: Apparently parasitic, taken from nest of another *Myrmica*. Host: *Myrmica* sp.  
*Myrmica lampira* Francoeur, 1968. Nat. Canad. 95:729. ♀, ♂.
- lobicornis** *fracticornis* Emery. Newfoundland s. to Tenn., Ohio w. to Rocky Mtns. Colo., N. Mex., Utah, Ariz. Ecology: Nests are usually near a stream or slough, under stones or wood. Host of the inquiline *Leptothorax provancheri* Emery. *M. lobicornis lobicornis* Nylander is Palearctic.  
*Myrmica rubra scabrinodis* var. *fracticornis* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:313. ♀.  
*Myrmica rubra scabrinodis* var. *detrinodis* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:316. ♀. A questionable synonym.

- Taxonomy:** Wheeler and Wheeler, 1952. *Psyche* 59:117 (larva). —Cole, 1953. *Tenn. Acad. Sci., Jour.* 28:242-243.
- Biology:** Wheeler, 1916. *Conn. State Geol. and Nat. Hist. Survey Bul.* 22:587-588. —Eidmann, 1933. *Zool. Anz.* 101:203. —Dennis, 1938. *Ent. Soc. Amer., Ann.* 31:288, 305. —Weber, 1941. *Canad. Ent.* 73:140-141 (effect of drouth on nesting habits in prairie states and provinces). —Weber, 1942. *Canad. Ent.* 74: 62. —Kannowski, 1957. *Psyche* 64: 1-5 (host of *Leptothorax provancheri* Emery). —Kannowski, 1959. *Insectes Sociaux* 6:121-124, 155-156 (flight activities, colony founding). —Wheeler and Wheeler, 1963. *Ants of N. Dak.*, pp. 104-106. —Gregg, 1963. *Ants of Colo.*, pp. 300, 302-303.
- lobicornis lobifrons** Pergande. Colo., N. Mex., Utah, Ariz., n. w. to Alaska. **Ecology:** In mountains at high elevations. Some authors consider this a synonym of *fratricornis*.  
*Myrmica sabuleti* var. *lobifrons* Pergande, 1900. *Wash. Acad. Sci., Proc.* 2: 521. ♀.  
*Myrmica rubra scabrinodis* var. *glacialis* Forel, 1904. *Soc. Ent. Belg., Ann.* 48: 154. ♀.
- Biology:** Gregg, 1963. *Ants of Colo.*, pp. 303-307.
- mexicana** Wheeler. Ariz., Mexico.  
*Myrmica mexicana* Wheeler, 1914. *N. Y. Ent. Soc., Jour.* 22: 52. ♀, ♀, ♂.
- Taxonomy:** Gregg, 1961. *N. Y. Ent. Soc., Jour.* 69: 211.
- monticola** Wheeler. Que., Mich. w. to Man., N. Dak., Colo. **Ecology:** Nests in woodlands under cover of objects.  
*Myrmica scabrinodis schencki* var. *monticola* Wheeler, 1917. *Amer. Acad. Arts and Sci., Proc.* 52:505. ♀, ♂.  
*Myrmica sabuleti nearctica* Weber, 1939. *Lloydia* 2: 148. ♀, ♀, ♂.
- Taxonomy:** Wheeler and Wheeler, 1952. *Psyche* 59:117 (larva).
- Biology:** Wheeler and Wheeler, 1944. *N. Dak. Hist. Quart.* 11: 243. —Wheeler and Wheeler, 1963. *Ants of N. Dak.*, pp. 106-108. —Gregg, 1963. *Ants of Colo.*, pp. 306-309. —Francoeur, 1966. *Nat. Canad.* 93: 455 (Que.).
- pinetorum** Wheeler. Mass. s. to S. C., w. to Ohio, Okla., Miss. **Ecology:** Prefers to nest in sandy soil.  
*Myrmica punctiventris pinetorum* Wheeler, 1905. *Amer. Mus. Nat. Hist., Bul.* 21:384. ♀, ♀.
- Biology:** Davis and Bequaert, 1922. *Brooklyn Ent. Soc., Bul.* 17:10. —Wesson and Wesson, 1940. *Amer. Midland Nat.* 24:90, 94.
- punctiventris** Roger. Mass. s. to Ga., w. to Iowa, Nebr., Ark. **Ecology:** Nests have been found in soil and rotten logs in woodlands.  
*Myrmica punctiventris* Roger, 1863. *Berlin Ent. Ztschr.* 7:190. ♀.  
*Myrmica punctiventris* var. *isafahani* Forel, 1922. *Rev. Suisse de Zool.* 30:92. ♀, ♀.
- Taxonomy:** Gregg, 1961. *N. Y. Ent. Soc., Jour.* 69:211.
- Biology:** Wheeler, 1905. *Amer. Mus. Nat. Hist., Bul.* 21:383-384. —Cole, 1940. *Amer. Midland Nat.* 24:55. —Headley, 1943. *Ohio Jour. Sci.* 43:25-26. —Buren, 1944. *Iowa State Col., Jour. Sci.* 18:283. —Kannowski, 1959. *Insectes Sociaux* 6:124.
- rubra** (Linnaeus). Que., Maine, Mass., R. I.; Europe. **Ecology:** Unlike other species of *Myrmica*, *rubra* is pugnacious and can inflict a painful sting. Probably accidentally introduced from Europe.  
*Formica rubra* Linnaeus, 1758. *Syst. Nat., Ed.* 10 1:580.  
*Myrmica laevinodis* Nylander, 1846. *Acta Soc. Fenn.* 2:927. ♀, ♀, ♂.  
*Myrmica rubra champlaini* Forel, 1901. *Naturhist. Mus. Hamburg Mitt.* 18:80. ♀.  
*Myrmica rubra laevinodis* var. *bruesi* Wheeler, 1906. *Psyche* 13:38. ♀, ♀, ♂.
- Taxonomy:** Wheeler and Wheeler, 1952. *Psyche* 58:119 (larva). —Picquet, 1958. *Dijon Univ. Lab. de Zool. Trav.* 23:28 (larva). —Yarrow, 1955. *Roy. Ent. Soc. London, Proc., Ser. B: Taxonomy.* 24:113-115. —Wheeler and Wheeler, 1960. *Ent. Soc. Amer., Ann.* 53:4-5 (larva).
- Biology:** Wheeler, 1908. *Jour. Econ. Ent.* 1:337-339 (introduced into Mass.). —Sturtevant, 1931. *Psyche* 38:75. —Brian, 1951. *Experientia* 7:182 (caste determination). —Brian, 1951.

Physiol. Comp. and Oecol. 2:248-262. —Brian, 1953. Physiol. Comp. and Oecol. 3:25-36 (oviposition by workers). —Brian, 1954. Insectes Sociaux 1:101-122 (caste differentiation, larval dormancy, winter size, vernalization). —Brian, 1955. Insectes Sociaux 2:1-34 (caste differentiation, growth of workers and intercastes). —Brian, 1955. Insectes Sociaux 2:85-114 (caste differentiation, larval dormancy, winter size, and vernalization). —Brian and Brian, 1955. Evolution 9: 280-290 (macrogynes and microgynes). —Brian, 1956. Insectes Sociaux 3:369-394 (caste differentiation, controlled larval nutrition). —Brian, 1956. Jour. Anim. Ecol. 25:319-337 (segregation of *Myrmica* spp.). —Brian, 1957. Insectes Sociaux 4:191-210 (serial organization of brood). —Brian, 1957. Physiol. Comp. and Oecol. 4:329-345 (food distribution and larval size in cultures). —Weir, 1958. Insectes Sociaux 5:315-339 (polyethism in workers). —Brian, 1962. Insectes Sociaux 9:295-310 (social conditions affecting early larval differentiation). —Brian, 1963. Insectes Sociaux 10:91-102 (caste differentiation). —Plateaux, 1960. Insectes Sociaux 7: 221. —Brian, 1965. Insectes Sociaux 12:347 (caste differentiation). —Brian, *et al.*, 1967. Insectes Sociaux 14:13-24 (caste differentiation). —Brian, 1969. Insectes Sociaux 16:249-268 (ecological notes). —Jaisson, 1969. Insectes Sociaux 16:279-312. —Brian, 1970. Animal Behavior 18:467-472 (communication between queens and larvae).

Morphology: Tulloch, 1936. Ent. Soc. Amer., Ann. 29:81-84 (metasternal glands). —Allen, 1957. Ent. Monthly Mag. 93:136-139 (intercastes). —Weir, 1959. Insectes Sociaux 6:375-386 (retro-cerebral endocrine glands and their relation to larval growth and development).

**spatulata** Smith. Tenn., Miss., Ill.

*Myrmica schencki* var. *spatulata* Smith, 1930. Ent. Soc. Amer., Ann. 23:566. ♀, ♀.

Biology: Smith, 1931. Ent. News 42:21.

**striolagaster** Cole. Tex., Colo., N. Mex., Ariz.

*Myrmica striolagaster* Cole, 1953. Tenn. Acad. Sci., Jour. 28:81. ♀.

Taxonomy: Cole, 1957. Tenn. Acad. Sci., Jour. 32:208-209 (male). —Gregg, 1961. N.Y. Ent. Soc., Jour. 69:211. —Wheeler and Wheeler, 1972. Ga. Ent. Soc., Jour. 7:234 (larva).

Biology: Gregg, 1963. Ants of Colo., pp. 313-314.

**wheeleri** Weber. Ariz. (Mt. Lemmon and Mt. Stratton in Santa Catalina Mtns.).

*Myrmica wheeleri* Weber, 1939. Lloydia 2:150. ♀, ♀, ♂.

#### UNPLACED TAXON OF MYRMICA

**rubra neolaevinodis** Forel. "From New York with iris roots". The iris from which the ants were taken may not have come from New York; consequently, this form may not belong in the Nearctic fauna.

*Myrmica rubra neolaevinodis* Forel, 1901. Naturhist. Mus. Hamburg Mitt. 18: 80. ♀.

#### Genus PARAMYRMICA Cole

*Paramyrmica* Cole, 1957. Tenn. Acad. Sci., Jour. 32:37-42.

Type-species: *Paramyrmica colax* Cole. Monotypic.

Little is known of the habits of the two species included in this genus. The genus is close to *Myrmica*, but differences in the larvae support the distinctness of *Paramyrmica*.

Taxonomy: Gregg, 1961. N. Y. Ent. Soc., Jour. 69:209-220.

**colax** Cole. Tex. (Limpia Canyon, Davis Mtns., Jeff Davis Co.). Ecology: An inquiline. Host:

*Myrmica striolagaster* Cole.

*Paramyrmica colax* Cole, 1957. Tenn. Acad. Sci., Jour. 32:37-41. ♀, ♀.

Taxonomy: Wheeler and Wheeler, 1959. Tenn. Acad. Sci., Jour. 34:291-220 (larva).

**rugiventris** (Smith). Colo., Ariz., s. Calif.

*Tetramorium rugiventris* Smith, 1943. Ent. Soc. Wash., Proc. 45:2, 4. ♀.

Taxonomy: Brown, 1957. Breviora 72:5-7 (an endemic species; in *Myrmica*). —Gregg, 1961. N. Y. Ent. Soc., Jour. 69:209 (in *Paramyrmica*). —Francoeur, 1968. Nat. Canad. 95:728 (probably in *Myrmica*).

## Genus MANICA Jurine

*Manica* Jurine, 1807. Nouv. Meth. Class. Hym. Dipt., p. 276.

Type-species: *Formica rubida* Latreille. Desig. by Wheeler, 1911.

*Aphaenogaster* subg. *Neomyrma* Forel, 1914. Rev. Suisse Zool. 22:275.

Type-species: *Aphaenogaster (Neomyrma) calderoni* Forel. Monotypic.

*Myrmica* subg. *Oreomyrma* Wheeler, 1914. Psyche 21:118.

Type-species: *Formica rubida* Latreille. Orig. desig.

Four of the five species in this genus are found in western North America, west of the hundredth meridian; the other is Palearctic. Colonies are small and nests are usually found in openings in coniferous forests commonly under stones in creek or river bottoms. For an excellent account of each species, see Wheeler and Wheeler (1970).

Revision: Wheeler, 1914. Psyche 21:118-122. —Wheeler and Wheeler, 1970. Kans. Ent. Soc., Jour. 43:129-162.

Taxonomy: Weber, 1947. Ent. Soc. Amer., Ann. 40:439. —Wheeler and Wheeler, 1952. Psyche 59:123 (larvae). —Cole, 1957. Tenn. Acad. Sci., Jour. 32:213 (key to males). —Wheeler and Wheeler, 1960. Ent. Soc. Wash., Proc. 62:15 (larva). —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 108-110. —Wheeler and Wheeler, 1972. Ga. Ent. Soc., Jour. 7:234-236 (larvae).

Biology: Wheeler and Wheeler, 1970. Kans. Ent. Soc., Jour. 43:129-162. —Wheeler and Wheeler, 1970. Kans. Ent. Soc., Jour. 43:363 (additions to natural history of *Manica*). —Went, Wheeler, and Wheeler, 1972. BioScience 22:82-88 (feeding and digestion).

Morphology: Fales, *et al.*, 1972. Jour. Ins. Physiol. 18: 1077-1088 (alarm pheromones derived from the mandibular gland).

**bradleyi** (Wheeler). W. Nev., Calif. Ecology: Typically found in openings in coniferous forests in the Sierra Nevada Mtns. of w. Nev. and Calif., and the Transverse Ranges in s. Calif.

Host of *Manica parasitica* (Creighton), but the exact relationship is not known.

*Myrmica bradleyi* Wheeler, 1909. N. Y. Ent. Soc., Jour. 17:77. ♀.

*Aphaenogaster (Neomyrma) calderoni* Forel, 1914. Rev. Suisse de Zool. 22:275. ♀.

Taxonomy: Cole, 1957. Tenn. Acad. Sci., Jour. 32:210-212 (female, male). —Wheeler and Wheeler, 1960. Ent. Soc. Wash., Proc. 62:5-6 (larva). —Wheeler and Wheeler, 1972. Ga. Ent. Soc., Jour. 7:234-235 (larva).

Biology: Creighton, 1934. Psyche 41:188-189. —Mallis, 1941. South. Calif. Acad. Sci., Bul. 40:65.

**hunteri** (Wheeler). Alta., Mont., Wyo., Idaho, Utah, B. C., Wash., Oreg., Nev., Calif. Ecology:

Typically found in openings in coniferous forests.

*Myrmica (Oreomyrma) hunteri* Wheeler, 1914. Psyche 21:119, 121. ♀.

*Myrmica (Oreomyrma) aldrichi* Wheeler, 1914. Psyche 21:119, 120. ♀.

Taxonomy: Cole, 1956. Tenn. Acad. Sci., Jour. 31:262. —Cole, 1957. Tenn. Acad. Sci., Jour. 32:212-213 (male). —Wheeler and Wheeler, 1972. Ga. Ent. Soc., Jour. 7:235 (larva).

**mutica** (Emery). N. Dak., S. Dak., Colo., N. Mex. w. to Alaska, B. C., Wash., Oreg., Calif.

Ecology: The most widely distributed ant of the genus in N. Amer. It is more xerophilous and occurs in a greater variety of habitats. Host of the inquiline *Symmyrmica chamberlini* Wheeler.

*Myrmica mutica* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:311. ♀.

Taxonomy: Cole, 1957. Tenn. Acad. Sci., Jour. 32: 213 (male). —Wheeler and Wheeler, 1960. Ent. Soc. Wash., Proc. 62:5-6 (larva). —Wheeler and Wheeler, 1972. Ga. Ent. Soc., Jour. 7:235 (larva).

Biology: Wheeler, 1904. Amer. Mus. Nat. Hist., Bul. 20:6-7. —Wheeler, 1910. Ants, pp. 432-434. —Cole, 1953. Tenn. Acad. Sci., Jour. 28:243. —Gregg, 1963. Ants of Colo., pp. 314-317. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 109-110.

**parasitica** (Creighton). Calif. (Alpine Co.; Yosemite Nat. Pk., Mariposa Co.). Ecology:

Collections made from ants nests. Host: *Manica bradleyi* (Wheeler).

*Myrmica (Manica) parasitica* Creighton, 1934. Psyche 41:185. ♀.

Biology: Mallis, 1941. South. Calif. Acad. Sci., Bul. 40:66. —Wheeler and Wheeler, 1968. Pan-Pacific Ent. 44:71-72 (rediscovery).

### Genus POGONOMYRMEX Mayr

Members of this genus are collectively known as harvester ants and some species are among the most conspicuous ants in the arid regions of the western United States and Mexico because of their mound building habits. The workers collect seeds for food, harvesting plants in their nesting areas by snipping off seeds with their mandibles. The seeds are stored and are the main food source though the ants are also scavengers. Nests are in the soil in areas fully exposed to the sun; some are under stones and others are surmounted by soil craters or by small to huge mounds with or without coverings of gravel. Some species alter the area surrounding their nest by clearing away the vegetation. Some species have a painful sting, procure seeds from cultivated crops and damage rangelands.

Revision: Wheeler, 1902. Amer. Nat. 36:85-100. —Wheeler, 1902. Psyche 9:387-393.

—Wheeler, 1914. Psyche 21:151-157. —Olsen, 1934. Harvard Univ., Mus. Comp. Zool., Bul. 77:493-514. —Cole, 1968. Pogonomyrmex Harvester Ants, 222 pp.

Taxonomy: Wheeler and Wheeler, 1952. Psyche 59:106-111 (larvae). —Cole, 1954. Tenn. Acad. Sci., Jour. 29:117-119. —Wheeler and Wheeler, 1960. Ent. Soc. Wash., Proc. 62:2 (larva). —Wheeler and Wheeler, 1972. Ga. Ent. Soc., Jour. 7:236-237 (larvae).

Morphology: Eisner, 1957. Harvard Univ., Mus. Comp. Zool., Bul. 116:477-478 (proventriculus). —McGurk, et al., 1966. Jour. Ins. Physiol. 12:1435-1441 (identification of 4-methyl-3-heptanone).

### Genus POGONOMYRMEX Subgenus POGONOMYRMEX Mayr

*Pogonomyrmex* Mayr, 1868. Soc. Nat. Modena, Ann. 3:169.

Type-species: *Formica badia* Latreille. Desig. by Wheeler, 1911.

#### SPECIES GROUP BARBATUS

**anergismus** Cole. N. Mex. (15 mi. e. Silver City, 6900 ft.). Ecology: Possibly a social parasite; found in nest of *P. rugosus*. Host: *Pogonomyrmex rugosus* Emery.

*Pogonomyrmex (Pogonomyrmex) anergismus* Cole, 1954. Tenn. Acad. Sci., Jour. 29:115-116. ♀, ♂.

**apache** Wheeler. Southwest. Kans. (?), w. Tex., s. Colo., N. Mex., s. Ariz., s. Nev.; Mexico.

Ecology: Colonies are small and the usually obscure nests are in stony soils with no superstructure though sometimes in sandy soil with small circular craters.

*Pogonomyrmex apache* Wheeler, 1902. Psyche 9:392. ♀.

*Pogonomyrmex sancti-hyacinthi* Wheeler, 1902. Psyche 9:388. ♀.

Biology: Wheeler, 1910. Ants, p. 283. —Cole, 1954. Tenn. Acad. Sci., Jour. 29:266-267.

—Gregg, 1963. Ants of Colo., pp. 318-319.

**barbatus** (Smith). E. Ark., e. La., s. and w. Kans., Okla., Tex., e. Colo., s. and central N. Mex., s.e. and central Ariz., Nev. (Clark Co.); Mexico. Ecology: The usual nest is a low to high gravel mound, frequently with a scooped-out center, though the nest structure varies. The most conspicuous ant of this genus in its range. Red harvester ant.

*Myrmica barbata* Smith, 1858. Cat. Hym. Brit. Mus. 6:130. ♀.

*Myrmica (Atta) molefaciens* Buckley, 1860. Acad. Nat. Sci. Phila., Proc. 12:445. ♀, ♀.

*Pogonomyrmex barbatus* var. *nigrescens* Wheeler, 1902. Psyche 9:389, 391. ♀.

Taxonomy: Emery, 1895. Zool. Jahrb., Abt. f. System. 8:308 (each caste). —Wheeler, 1914. N. Y. Ent. Soc., Jour. 22:51-52 (each caste). —Creighton, 1950. Harvard Univ., Mus. Comp. Zool., Bul. 104:116-119. —Wheeler and Wheeler, 1952. Psyche 59:107 (larva). —Wheeler and Wheeler, 1960. Ent. Soc. Wash., Proc. 62:2 (larva).

Biology: McCook, 1879. The Natural History of the Agricultural Ant of Texas, 311 pp.

—Wheeler, 1901. Soc. Ent. de Belg., Ann. 45:202. —Wheeler, 1901. Amer. Nat. 35:723-724.

—Wheeler, 1910. Ants, pp. 11, 85, 179, 197, 202-203, 222, 264, 284, 286-288, 290-293.

—Hunter, 1921. U. S. Dept. Agr. Bur. Ent. Cir. 148:4-7. —Gordon, 1943. Jour. Econ. Ent.

- 36:354 (damage to airplane runways). —Michener, 1948. N. Y. Ent. Soc., Jour. 56:239-242. —Cassidy, *et al.*, 1950. U. S. Dept. Agr. Cir. 842:15. —Barnes and Nerney, 1953. U. S. Dept. Agr. Farmers' Bul. 1668:1-11. —Young and Howell, 1954. Okla. Acad. Sci., Proc. 55:60-62 (mating swarms). —Young and Gonzalez, 1957. Mex. Secretaria de Agr. y Ganaderia, Fol. Tec. 23:1-20. —Michener, 1960. Kans. Ent. Soc., Jour. 33:46 (treetop mating aggregations). —Box, 1960. Ecology 41:381-382. —Gregg, 1963. Ants of Colo., pp. 319-321. —Johnson, *et al.*, 1969. Biochemical Genetics 3:429-450 (isozyme genotype-environment relationships in natural populations).
- Morphology: Williams and Williams, 1965. Soc. Exp. Biol. Med., Proc. 119:344-346 (venom). —Benthuyssen and Blum, 1974. Ga. Ent. Soc., Jour. 9: 235-238 (quantitative sensitivity of ant to enantiomers of its alarm pheromone).
- bicolor** Cole. S. Ariz.; Mexico. Ecology: Nests are in gravelly soil with a low mound of sand and with a single entrance. Apparently does not clear plants from nest periphery.  
*Pogonomyrmex (Pogonomyrmex) bicolor* Cole, 1968. Pogonomyrmex Harvester Ants, pp. 59-64. ♀, ♀, ♂.
- desertorum** Wheeler. W. Tex., s. N. Mex., s. Ariz., s.e. Calif.; Mexico. Ecology: Nests are in sandy soil in open areas and have circular craters.  
*Pogonomyrmex desertorum* Wheeler, 1902. Psyche 9:387, 390. ♀.  
*Pogonomyrmex desertorum* var. *ferrugineus* Olsen, 1934. Harvard Univ., Mus. Comp. Zool., Bul. 77:496. ♀.
- Taxonomy: Cole, 1954. Tenn. Acad. Sci., Jour. 29:119.
- Biology: Wheeler, 1910. Ants, p. 283. —Cole, 1934. Ent. Soc. Amer., Ann. 27:399. —Mallis, 1941. South. Calif. Acad. Sci., Bul. 40:64. —Whitford and Ettershank, 1975. Environ. Ent. 4: 689-696 (factors affecting foraging activity).
- rugosus** Emery. W. Okla., w. Tex., s.e. and s.w. Colo., N. Mex., s. Utah, Ariz., s. and central Nev., s. Calif.; Mexico. Ecology: Typically, the nest is a flattened gravel disc, though there is variation in structure.  
*Pogonomyrmex barbatus rugosus* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:309. ♀, ♂.  
*Pogonomyrmex barbatus* var. *fuscatus* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:309. ♀.  
*Pogonomyrmex barbatus* var. *marfensis* Wheeler, 1902. Amer. Nat. 36:98. ♀.  
*Pogonomyrmex similis* Olsen, 1934. Harvard Univ., Mus. Comp. Zool., Bul. 77:497, 512. ♀.  
*Pogonomyrmex barbatus curvispinosus* Cole, 1936. Ent. News 47:120. ♀.  
*Pogonomyrmex barbatus spadix* Cook, 1953. The Ants of Calif., pp. 98-99, 3 figs. ♀. No description.
- Taxonomy: Wheeler, 1902. Psyche 9:391, 393 (each caste).
- Biology: Wheeler, 1902. Psyche 9:393. —Wheeler, 1910. Ants, pp. 284, 290. —Wheeler, 1917. Psyche 24:178. —Cole, 1937. Ent. News 48:134. —Cole, 1942. Amer. Midland Nat. 28:367. —Lindquist, 1942. Jour. Econ. Ent. 35:850-853. —Gregg, 1963. Ants of Colo., pp. 322-324, 325, 327. —Wheeler and Wheeler, 1973. Ants of Deep Canyon, p. 50. —Whitford and Ettershank, 1975. Environ. Ent. 4: 689-696 (factors affecting foraging activity).
- tenuispina** Forel. S. Calif. (Deep Canyon); Mexico (Baja Calif.).  
*Pogonomyrmex desertorum* var. *tenuispina* Forel, 1914. Soc. Vaud. des Sci. Nat., Bul. 50:269. ♀.  
*Pogonomyrmex dentatus* Olsen, 1934. Harvard Univ., Mus. Comp. Zool., Bul. 77:505. ♀.
- Taxonomy: Cole, 1968. Pogonomyrmex Harvester Ants, pp. 77-81. —Wheeler and Wheeler, 1973. Ants of Deep Canyon, pp. 50-51 (first U. S. record).
- SPECIES GROUP OCCIDENTALIS
- anzensis** Cole. Calif. (Split Mtn., Anza Desert State Park).  
*Pogonomyrmex (Pogonomyrmex) anzensis* Cole, 1968. Pogonomyrmex Harvester Ants, pp. 87-89. ♀.
- brevispinosus** Cole. S. Calif., Nev. (Lyon Co.). Ecology: Nests are in compact sandy soil, each marked by a low circular crater 3 to 8 inches in diameter with a single entrance.  
*Pogonomyrmex (Pogonomyrmex) brevispinosus* Cole, 1968. Pogonomyrmex Harvester Ants, pp. 89-94. ♀, ♀, ♂.

**occidentalis** (Cresson). Southwest. N. Dak., w. S. Dak., w. Nebr., central and w. Kans., central and w. Okla., n. Tex., s.e. Mont., Wyo., Colo., N. Mex., s.e. Idaho, Utah, e. and n. Ariz., Nev., e. Calif. Ecology: The populous colonies build conical pebble mounds with basal entrances and peripheral clearings. Workers are pugnacious and are active harvesters, feeding on and storing large quantities of seeds. Western harvester ant.

*Myrmica occidentalis* Cresson, 1895. Ent. Soc. Phila., Proc. 4:426. ♀, ♀.

*Myrmica seminigra* Cresson, 1865. Ent. Soc. Phila., Proc. 4:427. ♂.

*Pogonomyrmex opaciceps* Mayr, 1870. Zool.-Bot. Gesell. Wien, Verh. 20:971. ♀.

*Pogonomyrmex occidentalis ruthveni* Gaige, 1914. Biol. Soc. Wash., Proc. 27:93. ♀, ♀, ♂.

*Pogonomyrmex occidentalis* var. *utahensis* Olsen, 1934. Harvard Univ., Mus. Comp. Zool., Bul. 77:498, 509. ♀, ♀, ♂.

Taxonomy: Smith, 1953. Brooklyn Ent. Soc., Bul. 48:131. —Wheeler and Wheeler, 1952. Psyche 59:110 (larva).

Biology: McCook, 1882. The Honey Ants of the Garden of the Gods, and the Occident Ants of the American Plains, pp. 123-160. —Dean, 1905. Kans. Acad. Sci., Trans. 19:164-170. —Headlee and Dean, 1908. Kans. State Col., Bul. 154:165-180. —Wheeler, 1910. Ants, pp. 145, 200, 202-205, 222, 283-284, 290, 291, 426. —Herrick, 1914. Insects Injurious to the Household and Annoying to Man, pp. 172-173. —Cole, 1934. Ent. News 45:170. —Cole, 1942. Amer. Midland Nat. 28:366. —Knowlton, 1951. Brooklyn Ent. Soc., Bul. 46:75 (loss of surface area on western rangeland). —Weber, 1959. Ent. News 70:85 (stings; note on populations). —Chew, 1960. N. Y. Ent. Soc., Jour. 68:81 (colony size and activity). —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 118-120. —Gregg, 1963. Ants of Colo., pp. 328-334 (as *occidentalis comanche*). —Spangler, 1968. Kans. Ent. Soc., Jour. 41:318-323 (behavior). —Lavigne, 1969. Ent. Soc. Amer., Ann. 62:1166-1175 (bionomics and nest structure). —Clark and Camanor, 1973. Biol. Soc. Nev., Occ. Papers 34:1-6 (use of seed stores by Heteromyid rodents). —Lavigne and Rogers, 1974. Wyo. Univ. Agr. Exp. Sta. Sci. Monog. 26: 1-14 (annotated bibliography).

**owyheeii** Cole. Sask., central and w. Mont., n.w. Wyo., Alta., Idaho, n.w. Utah, B. C., Wash., Oreg., n. Nev., n.e. Calif. Ecology: Nest structure and habits are similar to those of *P. occidentalis*.

*Pogonomyrmex occidentalis owyheeii* Cole, 1938. Amer. Midland Nat. 19:240. ♀, ♀.

Biology: Cole, 1932. Ohio Jour. Sci. 32:17-20, 133-146, 245-246, 533-538 (as *occidentalis*). —Cole, 1933. Ent. News 44:16-19 (as *occidentalis*). —Cole, 1934. Canad. Ent. 66:193-198 (as *occidentalis*). —Cole, 1934. Ent. News 45:96-101 (as *occidentalis*). —Willard and Crowell, 1965. Jour. Econ. Ent. 58:484-489 (biology; e. Oreg.). —Lavigne and Rogers, 1974. Wyo. Univ., Agr. Exp. Sta. Sci. Monog. 26: 14-18 (annotated bibliography).

**salinus** Olsen. Southeast. Oreg., Nev., e. Calif. Ecology: Found mostly in pinyon-juniper areas; nests are a low bed of gravel with a cleared area surmounted by one or more craterlike depressions each with one entrance. A docile ant.

*Pogonomyrmex salinus* Olsen, 1934. Harvard Univ., Mus. Comp. Zool., Bul. 77:498, 510. ♀.

Taxonomy: Wheeler and Wheeler, 1972. Ga. Ent. Soc., Jour. 7:237 (larva).

**subdentatus** Mayr. Southwest. Oreg., w. Nev., Calif. Ecology: A timid, inoffensive ant whose nests are low, irregular beds of sand and gravel with more than one entrance. Mayr's citation of this form from Conn. is an error.

*Pogonomyrmex subdentatus* Mayr, 1870. Zool.-Bot. Gesell. Wien, Verh. 20:971. ♀.

Biology: Cole, 1934. Ent. Soc. Amer., Ann. 27:399. —Mallis, 1941. South. Calif. Acad. Sci., Bul. 40:65.

**subnitidus** Emery. Nev. (?) (Nye Co., Lyon Co.). coastal central and s. Calif.; Mexico. Ecology: Nests are in sand or loose, sandy soil surmounted by semicircular or circular craters or marked by irregular beds of sand.

*Pogonomyrmex occidentalis* var. *subnitidus* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:310. ♀.

Biology: Cole, 1934. Ent. Soc. Amer., Ann. 27:399. —Mallis, 1941. South. Calif. Acad. Sci., Bul. 40:65. —Wheeler and Wheeler, 1973. Ants of Deep Canyon, p. 52.

## SPECIES GROUP MARICOPA

- californicus** (Buckley). W. Tex., s. N. Mex., s. Utah, Ariz., Nev., s. Calif.; Mexico. Ecology: Nests are surmounted by a circular or semicircular crater of loose sand and have a single entrance. California harvester ant.
- Myrmica californica* Buckley, 1867. Ent. Soc. Phila., Proc. 6:336. ♀.
- Pogonomyrmex badius* var. *estebanius* Pergande, 1893. Calif. Acad. Sci., Proc. 4:33. ♂, ♀.
- Pogonomyrmex californicus longinodis* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:311. ♀.
- Pogonomyrmex californicus nitratus* Cook, 1953. The Ants of Calif., pp. 99-100, 3 figs. ♀.
- Biology: Wheeler, 1910. Ants, pp. 188-190, 200-201, 284-286, 290-291. —Essig, 1926. Ins. of West. N. Amer., p. 861. —Cole, 1934. Ent. Soc. Amer., Ann. 27:399. —Michener, 1942. Sci. Monthly 55:248-258 (history and behavior of a colony). —Michener, 1960. Kans. Ent. Soc., Jour. 33:46 (treetop mating habit). —McCluskey, 1969. Amer. Zool. 9:566 (flights). —Erickson, 1972. Ent. Soc. Amer., Ann. 65:57-61 (mark-recapture techniques for population estimates). —Wheeler and Wheeler, 1973. Ants of Deep Canyon pp. 53-60. —Whitford and Ettershank, 1975. Environ. Ent. 4: 689-696 (factors affecting foraging activity).
- Morphology: Shapley, 1921. Natl. Acad. Sci., Proc. 6:687-690 (pterergates). —Tullock, 1930. Psyche 37:61-70.
- comanche** Wheeler. Southwest. Ark., w. La., s. Kans., Okla., e. Tex. Ecology: Nests are in sandy areas in close proximity to post-oak groves and each is marked by a crescentric or circular crater of sand or sandy soil 3 inches to 2 feet in diameter with a single entrance.
- Pogonomyrmex occidentalis comanche* Wheeler, 1902. Psyche 9:392. ♀.
- Biology: Wheeler, 1910. Ants, pp. 201, 284-285, 292. —Strandtmann, 1942. Ent. Soc. Amer., Ann. 38:140.
- magnacanthus** Cole. S. Nev., w. Ariz., s. Calif.; Mexico. Ecology: Nests are in loose, sandy soil of open deserts with a circular, shallow crater 4 to 6 inches in diameter.
- Pogonomyrmex (Pogonomyrmex) magnacanthus* Cole, 1968. Pogonomyrmex Harvester Ants, pp. 133-137. ♂, ♀, ♂.
- Biology: Wheeler and Wheeler, 1973. Ants of Deep Canyon, pp. 60-61.
- maricopa** Wheeler. W. Tex., s. Colo., N. Mex., s. Utah, s. Nev., Ariz., s.e. Calif.; Mexico. Ecology: Nests and habits are similar to those of *P. californicus*.
- Pogonomyrmex californicus maricopa* Wheeler, 1914. Psyche 21:155. ♂, ♀.
- Pogonomyrmex californicus barnesi* Smith, 1929. Ent. Soc. Amer., Ann. 22:546. ♀.
- Pogonomyrmex californicus sinaloanus* Olsen, 1934. Harvard Univ., Mus. Comp. Zool., Bul. 77:504. ♀.
- Taxonomy: Cole, 1954. Tenn. Acad. Sci., Jour. 29:120.
- Biology: Cole, 1934. Ent. Soc. Amer., Ann. 27:399. —Gregg, 1963. Ants of Colo., pp. 326-328. —Wheeler and Wheeler, 1973. Ants of Deep Canyon, pp. 61-62.

## SPECIES GROUP BADIUS

- badius** (Latreille). N. C., S. C., Ga., Fla., Ala., Miss., La. Ecology: Nests are in sand or sandy soil usually in open woodlands and grassy fields; they construct single or multiple, flattened, circular sand craters or dome-shaped sand mounds with depressed tops. The only species of *Pogonomyrmex* found east of the Mississippi River and the only N. Amer. polymorphic species. Florida harvester ant.
- Formica badia* Latreille, 1802. Hist. Nat. Fourmis, p. 238. ♀, ♀.
- Myrmica transversa* Smith, 1858. Cat. Hym. Brit. Mus. 6:129. ♀.
- Atta crudelis* Smith, 1858. Cat. Hym. Brit. Mus. 6:170. ♂, ♀.
- Myrmica brevipennis* Smith, 1858. Cat. Hym. Brit. Mus. 6:130. ♂. A questionable syn.
- Taxonomy: Wheeler and Wheeler, 1960. Ent. Soc. Wash., Proc. 62:2 (larva).



Biology: Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21:384-385. —Turner, 1909. Biol. Bul. 17:161-170. —Wheeler, 1910. Ants, pp. 131, 152, 201, 280, 283-285, 292. —Wray, 1938. Ent. Soc. Amer., Ann. 31:196-200. —Van Pelt, 1953. Tenn. Acad. Sci., Jour. 28:164-168. —Van Pelt, 1958. Amer. Midland Nat. 59:11-12. —Carter, 1962. Elisha Mitchell Sci. Soc., Jour. 78:172. —Golley and Gentry, 1964. Ecology 45:217-225. —Hangartner, Reichson, and Wilson, 1970. Animal Behavior 18:331-334 (orientation to nest material). —Gentry and Carlson, 1970. Assoc. Southeast. Biol., Bul. 17:44 (formation and early development). —Holldobler and Wilson, 1970. Psyche 77:385-399 (recruitment trails). —Holldobler, 1971. Science 171:1149-1151 (homing). —Nickle and Neal, 1972. Fla. Ent. 55:65-66 (foraging behavior). —Morrill, 1972. Fla. Ent. 55:59-60 (tool using behavior). —Morrill, 1975. Ga. Ent. Soc., Jour. 10: 50-51 (a predator, *Apiomerus crassipes crassipes* (F.) (Reduviidae)).

Morphology: Wilson, Durlach, and Roth, 1958. Psyche 65:108-114 (chemical releasers of necrophoric behavior). —Wilson, 1958. Psyche 65:41-51 (chemical releasers of alarm and digging behavior). —Hermann and Blum, 1967. Ent. Soc. Amer., Ann. 60:661-668 (morphology and histology of poison apparatus). —Blum and Hermann, 1969. Ga. Ent. Soc., Jour. 4:23-28 (poison gland, functions of the main glandular elements).

UNPLACED TAXON OF POGONOMYRMEX SUBGENUS POGONOMYRMEX

*Pogonomyrmex (Pogonomyrmex) californicus* var. *Hindleyi* Forel, 1914. Soc. Vaud. des Sci. Nat., Bul. 50:270. ♀. Calif. (Escondido).

Genus POGONOMYRMEX Subgenus EPHEBOMYRMEX Wheeler

*Pogonomyrmex* subg. *Epebomyrmex* Wheeler, 1902. Psyche 9:390.

Type-species: *Pogonomyrmex naegeli* Forel. Desig. by Wheeler, 1911.

Biology: Creighton, 1956. Psyche 63:54-56.

**huachucanus** Wheeler. N. Mex., Ariz. Ecology: Nests are in stony soil, sometimes under stones, in the open exposed to the sun; there is little or no excavated soil.

*Pogonomyrmex huachucanus* Wheeler, 1914. Psyche 21:151. ♀.

Taxonomy: Creighton, 1952. Psyche 59:76-81 (each caste). —Wheeler and Wheeler, 1972. Ga. Ent. Soc., Jour. 7:237 (larva).

Biology: Cole, 1954. Tenn. Acad. Sci., Jour. 26:119.

**imberbiculus** Wheeler. Southwest. Okla., central and w. Tex., s.w. Colo., N. Mex., s. Ariz., s. Nev., s. Calif.; Mexico. Ecology: Nests are in open or under stones, sometimes with a small crater.

*Pogonomyrmex imberbiculus* Wheeler, 1902. Amer. Nat. 36:87, 97. ♀.

*Pogonomyrmex (Epebomyrmex) townsendi* Wheeler, 1909. N. Y. Ent. Soc., Jour. 17:80. ♀.

Taxonomy: Creighton, 1956. Psyche 63:63-64 ♀. —Wheeler and Wheeler, 1952. Psyche 59:111 (larva). —Wheeler and Wheeler, 1972. Ga. Ent. Soc., Jour. 7:237 (larva).

Biology: Wheeler, 1910. Ants, pp. 283-284, 290, 292. —Wheeler, 1917. Psyche 24:178-179.

—Creighton, 1956. Psyche 63:54-56. —Gregg, 1963. Ants of Colo., pp. 334-336. —Wheeler and Wheeler, 1973. Ants of Deep Canyon, pp. 63-64.

**pima** Wheeler. S. Ariz.; Mexico. Ecology: Habits are similar to those of *P. imberbiculus*.

*Pogonomyrmex (Epebomyrmex) pima* Wheeler, 1909. N. Y. Ent. Soc., Jour. 17:79. ♀.

Biology: Wheeler, 1910. Ants, p. 283. —Cole, 1934. Ent. Soc. Amer., Ann. 27:399-400.

—Creighton, 1956. Psyche 63:61.

TRIBE PHEIDOLINI

Genus STENAMMA Westwood

*Stenamma* Westwood, 1840. Introduct. Mod. Class. Ins., Sup. 2:83.

Type-species: *Stenamma westwoodii* Westwood. Monotypic.

*Asemorhoptrum* Mayr, 1861. Die Europäischen Formiciden, p. 76.

Type-species: *Myrmica lippula* Nylander. Monotypic.

*Theryella* Santschi, 1921. Soc. d'Hist. Nat. l'Afrique de Nord, Bul. 12:68.

Type-species: *Theryella myops* Santschi. Monotypic.

This is a holarctic genus which also extends into the Neotropical Region. Nests are usually in wooded areas where the small colonies are found in logs, stumps, branches, in soil beneath rocks, moss, debris, or humus. Workers are apparently predatory, feeding mostly on other arthropods. Snelling (1973) set up five species groups for the 12 western species of this genus; other North American species may belong to one of these groups or form new groups.

Revision: Emery, 1895. Zool. Jahrb., Abt. f. System. 8:297-301. —Forel, 1901. Soc. Ent. de Belg., Ann. 45:347-348. —Wheeler, 1903. Psyche 10:164-168. —Smith, 1957. Amer. Midland Nat. 57:133-174 (N. Amer.). —Snelling, 1973. Los Angeles Co. Mus., Contrib. Sci. 245:1-38 (western N. Amer.).

Taxonomy: Wheeler and Wheeler, 1953. Ent. Soc. Wash., Proc. 55:50-52. (larvae).

Biology: Francoeur, 1966. Ent. Soc. Quebec, Ann. 11:115-119 (4 species in Que.).

**brevicornis** (Mayr). N. S., Que. s. to Va., w. to Ont., Minn., Nebr., Colo. (?). Ecology: Prefers to nest in wooded areas, though sometimes found in meadows, in soil under stones, in debris, rotting wood, etc.

*Aphaenogaster brevicornis* Mayr, 1886. Zool.-Bot. Gesell. Wien, Verh. 36:443, 447-448. ♀, ♀.

*Stenamma neoarcticum* (!) Mayr, 1886. Zool.-Bot. Gesell. Wien, Verh. 36:454. ♀ (female, male misdet.).

Biology: Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21:373, 382. —Wheeler, 1917. Conn. State Geol. and Nat. Hist. Survey Bul. 22:585. —Kannowski, 1958. Ent. News 69:231-233 (swarming of males). —Gregg, 1963. Ants of Colo., pp. 346-348. —Francoeur, 1966. Ent. Soc. Quebec, Ann. 11:115-119.

**californicum** Snelling. Calif. Ecology: Found in fern humus and oak leaf litter.

*Stenamma californicum* Snelling, 1973. Los Angeles Co. Mus., Contrib. Sci. 245:16-18. ♀, ♀.

**carolinense** Smith. N. C. (Hoffman, Richmond Co.). Ecology: Collected in sparsely vegetated sandy soil.

*Stenamma carolinense* Smith, 1951. Ent. Soc. Wash., Proc. 53:156-158. ♀.

**chiricahua** Snelling. S. Ariz. Ecology: Found in mountains in shaded creek bed.

*Stenamma chiricahua* Snelling, 1973. Los Angeles Co. Mus., Contrib. Sci. 245:7-10. ♀, ♀, ♂.

**diecki** Emery. Que., Maine s. to N. C., w. to B. C., Wash., Oreg., Calif.; Mexico. Ecology: A widespread species adapted to various habitats but apparently absent in the southern states from S. C. to Fla., w. to Tex. Nests are usually in wooded areas in rotting wood or under objects.

*Stenamma westwoodi diecki* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:300. ♀, ♀.

*Stenamma westwoodi diecki* var. *impressum* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:301. ♀.

Taxonomy: Wheeler and Wheeler, 1953. Ent. Soc. Wash., Proc. 55:50 (larva). —Snelling, 1973. Los Angeles Co. Mus., Contrib. Sci. 245:18-21.

Biology: Wheeler and Wheeler, 1944. N. Dak. Hist. Quart. 11:244. —Dennis, 1938. Ent. Soc. Amer., Ann. 31:284, 304. —Cole, 1950. Tenn. Acad. Sci., Jour. 25:297. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 121-122. —Gregg, 1963. Ants of Colo., pp. 350-351, 353. —Francoeur, 1966. Ent. Soc. Quebec, Ann. 11:115-119. —Lettendre and Pilon, 1972. Nat. Canad. 99:73-82 (in Que.).

**dyscheres** Snelling. Calif. Ecology: Found at low to moderate elevations in the Sierra Nevada foothills. Specimens have been found in pine duff.

*Stenamma dyscheres* Snelling, 1973. Los Angeles Co. Mus., Contrib. Sci. 245:21-25. ♀, ♀, ♂.

**exasperatum** Snelling. Calif. (Calaveras Co. and Yosemite Nat. Pk.). Ecology: Found under stones in Sequoia and pine forests.

*Stenamma exasperatum* Snelling, 1973. Los Angeles Co. Mus., Contrib. Sci. 245:28-30. ♀.

- foveolocephalum** Smith. Miss. (2 mi. s. of Ackerman). Ecology: Specimens collected from sandy soil on a thinly wooded hillside.  
*Stenamma foveolocephala* (!) Smith, 1930. Ent. Soc. Amer., Ann. 23:564. ♀.
- Biology: Smith, 1931. Ent. News 42:17.
- heathi** Wheeler. Nev., Calif.; Mexico. Ecology: Collected under rocks in pine forests.  
*Stenamma brevicorne heathi* Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34:410. ♀.
- Taxonomy: Snelling, 1973. Los Angeles Co. Mus., Contrib. Sci. 245:30-34.
- huachucanum** Smith. Colo., Ariz. Ecology: Collected from under rocks.  
*Stenamma huachucanum* Smith, 1957. Amer. Midland Nat. 57:153. ♀.
- Taxonomy: Snelling, 1973. Los Angeles Co. Mus., Contrib. Sci. 245:34.
- Biology: Gregg, 1963. Ants of Colo., pp. 350-351, 353.
- impar** Forel. Que., Mass. s. to N. C., w. to N. Dak., Ill., Mo. Ecology: Nests in soil or rotten wood.  
*Stenamma brevicorne impar* Forel, 1901. Soc. Ent. de Belg., Ann. 45:347. ♀, ♀.
- Biology: Wheeler and Wheeler, 1963. Ants of N. Dak., p. 122. —Francoeur, 1966. Ent. Soc. Quebec, Ann. 11:115-119.
- meridionale** Smith. Va. s. to Ga., w. to Ill., Ark. Ecology: Found in wooded areas in soil.  
*Stenamma meridionale* Smith, 1957. Amer. Midland Nat. 57:169-171. ♀, ♀.
- occidentale** Smith. S. Dak., Colo., N. Mex., Idaho, Utah, Ariz., B. C., Wash., Oreg., Calif.; Mexico. Ecology: Nests in soil under rocks.  
*Stenamma occidentale* Smith, 1957. Amer. Midland Nat. 57:146. ♀, ♀, ♂.
- Taxonomy: Snelling, 1973. Los Angeles Co. Mus., Contrib. Sci. 245:25-28.
- Biology: Gregg, 1963. Ants of Colo., pp. 352-354.
- punctatoventre** Snelling. Calif. Ecology: Specimens collected under a decayed limb in litter.  
*Stenamma punctatoventre* Snelling, 1973. Los Angeles Co. Mus., Contrib. Sci. 245:10-12. ♀, ♀, ♂.
- schmittii** Wheeler. Que., Maine s. to N. C., w. to Minn., Iowa, Mo., Tenn. Ecology: Nests in wooded areas under stones, rotten wood and litter.  
*Stenamma brevicorne schmittii* Wheeler, 1903. Psyche 10:167. ♀.
- Biology: Wesson and Wesson, 1940. Amer. Midland Nat. 24:93. —Francoeur, 1966. Ent. Soc. Quebec, Ann. 11:115-119.
- sequoiarum** Wheeler. Calif. (coastal region from Siskiyou Co. to San Luis Obispo Co.). Ecology: Specimens have been found under stones in redwood forests and in redwood litter.  
*Stenamma brevicorne sequoiarum* Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52:520. ♀, ♀.
- Taxonomy: Snelling, 1973. Los Angeles Co. Mus., Contrib. Sci. 245:28.
- smithi** Cole. Idaho, Utah, Nev. Ecology: Collected from sagebrush and juniper duff.  
*Stenamma smithi* Cole, 1966. Brigham Young Univ., Sci. Bul., Biol. Ser. 7 (3):7. ♀.  
*Stenamma knowltoni* Gregg, 1972. Great Basin Nat. 32:35-39. ♀, ♀.
- Taxonomy: Snelling, 1973. Los Angeles Co. Mus., Contrib. Sci. 245:12-16.
- wheelerorum** Snelling. Nev. (Mt. Rose, Washoe Co., 8800 ft.).  
*Stenamma wheelerorum* Snelling, 1973. Los Angeles Co. Mus., Contrib. Sci. 245:34-35. ♀, ♀.

#### Genus APHAENOGASTER Mayr

- Aphaenogaster* Mayr, 1853. Zool.-Bot. Gesell. Wien, Verh. 3:107.  
 Type-species: *Aphaenogaster sardous* Mayr. Desig. by Bingham, 1903.
- Deromyrma* Forel, 1913. Zool. Jahrb., Abt. f. System. 36:772.  
 Type-species: *Aphaenogaster (Ischnomyrma) swammerdami* Forel. Monotypic.
- Planimyrmica* Viehmeier, 1914. Zool. Jahrb., Abt. f. System. 37:604.  
 Type-species: *Stenamma (Ischnomyrma) lorlai* Emery. Orig. desig.

*Aphaenogaster* subg. *Attomyrma* Emery, 1915. Accad. delle Sci. dell'Ist. Bologna, Rend. (n. s.) 19: 70.

Type-species: *Formica subterranea* Latreille. Orig. desig.

*Novomessor* Emery, 1915. Accad. delle Sci. dell'Ist. Bologna, Rend. (n. s.) 19:73.

Type-species: *Aphaenogaster (Ischnomyrmex) cockerelli* Andre. Orig. desig.

*Nystalomyrma* Wheeler, 1916. Roy. Soc. So. Austral., Trans. 40:215.

Type-species: *Myrmica longiceps* Smith. Orig. desig.

Most species of this genus nest in soil beneath a covering object but some may be in rotten logs or arboreal in dead branches. Two species, *mariae* and *tennesseensis* are believed to be temporary social parasites but more investigation is needed. The genus is worldwide. The North American fauna is in need of intensive study.

Revision: Mayr, 1886. Zool.-Bot. Gesell. Wien, Verh. 36:443-446. —Emery, 1895. Zool. Jahrb., Abt. f. System. 8:301-306. —Wheeler and Wheeler, 1934. Psyche 41:6-12 (*treatae* and forms). —Wheeler and Creighton, 1934. Amer. Acad. Arts and Sci., Proc. 69:343-354 (*Novomessor*). —Enzmann, 1947. N. Y. Ent. Soc., Jour. 55:147-151 (*Novomessor*).

Taxonomy: Wheeler and Wheeler, 1953. Ent. Soc. Wash., Proc. 55:54-62 (larvae). —Brown, 1973. In Meggers, et al., Tropical forest ecosystems in Afr. and S. Amer., pp. 178-185 (generic syn.). —Brown, 1974. Ent. News 85: 45-47 (justification of synonymy of *Novomessor*).

Biology: Fellers and Fellers, 1976. Science 192: 70-72 (tool use in 4 species).

*albisetosa* Mayr. Tex., N. Mex., Ariz.; Mexico. Ecology: Found in arid plateaus, at elevations of 2,500 to 5,000 feet; makes small crater nests, often under large stones. Omnivorous, but has a preference for fruits and seeds.

*Aphaenogaster albisetosa* Mayr, 1886. Zool.-Bot. Gesell. Wien., Verh. 36:443, 446. ♀.

*Novomessor cockerelli* var. *minor* Enzmann, 1947. N. Y. Ent. Soc., Jour. 55:148. ♀.

Taxonomy: Wheeler and Wheeler, 1953. Ent. Soc. Wash., Proc. 55:70 (larva). —Wheeler and Wheeler, 1960. Ent. Soc. Wash., Proc. 62:8 (larva).

Biology: Wheeler, 1910. Ants, pp. 280-282. —Cole, 1934. Ent. Soc. Amer., Ann. 27:398.

—Creighton, 1955. Psyche 62:89-97.

*ashmeadi* (Emery). N. C., Tenn. s. to Fla., w. to Mo., Tex.

*Stenamma (Aphaenogaster) treatae* var. *ashmeadi* Emery, 1985. Zool. Jahrb., Abt. f. System. 8:302. ♀.

*Aphaenogaster treatae harnedi* Wheeler, 1919. Psyche 26:50. ♀.

Taxonomy: Wheeler, 1919. Psyche 26:50. —Smith, 1924. Ent. News 35:50.

*boulderensis boulderensis* Smith. Ariz. (Horseshoe Is., Mead Lake); Nev., Tex. (?). Ecology: Probably nests in small colonies beneath stones. Possibly confused with *A. mutica* Pergande.

*Aphaenogaster (Attomyrma) boulderensis* Smith, 1941. Great Basin Nat. 2:118, 120. ♀.

Biology: Cole, 1966. Brigham Young Univ., Sci. Bul., Biol. Ser. 7:9.

*boulderensis smithi* Gregg. N. Mex. (Carrizozo).

*Aphaenogaster (Attomyrma) boulderensis smithi* Gregg, 1949. Ent. Soc. Wash., Proc. 51:171. ♀.

*cockerelli* Andre. Tex., N. Mex., Ariz., Nev., s. Calif.; Mexico. Ecology: Found in arid plateaus as high as 7,000 ft. Constructs large craters of pebbles under four inches in height with a single entrance.

*Aphaenogaster (Ischnomyrmex) cockerelli* Andre, 1893. Rev. de. Ent. 12:150. ♀.

*Aphaenogaster sonorae* Pergande, 1893. Calif. Acad. Sci., Proc. 4:34. ♀.

Taxonomy: Wheeler and Wheeler, 1960. Ent. Soc. Wash., Proc. 62:10 (larva). —Wheeler and Wheeler, 1972. Ga. Ent. Soc., Jour. 7:239 (larva).

Biology: Wheeler, 1910. Ants, pp. 69, 178, 201, 280-282. —Cole, 1934. Ent. Soc. Amer., Ann. 27:397-398. —Mallis, 1941. South. Calif. Acad. Sci., Bul. 40:67. —Cole, 1953. Tenn. Acad. Sci., Jour. 28:243. —Creighton, 1955. Psyche 62:89-97. —Whitford and Ettershank, 1975. Environ. Ent. 4: 689-696 (factors affecting foraging activity).

- Morphology:** Vick, Drew, *et al.*, 1969. Ent. Soc. Amer., Ann. 62:723-725 (identification of hydrocarbons).
- flemingi** Smith. N. C. s. to Fla., w. to Ky., La.  
*Aphaenogaster texana flemingi* Smith, 1928. Ent. News 39:275. ♀.  
*Aphaenogaster texana macrospina* Smith, 1934. Ent. Soc. Amer., Ann. 27:386. ♀.
- Taxonomy:** Wheeler and Wheeler, 1972. Ga. Ent. Soc., Jour. 7:238 (larva). —Smith, 1957. Brooklyn Ent. Soc., Bul. 52:113.
- floridana** Smith. N. C. s. to Fla., Ala.  
*Aphaenogaster (Attomyrma) floridana* Smith, 1941. Great Basin Nat. 2:118. ♀.
- Taxonomy:** Wheeler and Wheeler, 1960. Ent. Soc. Wash., Proc. 62:7 (larva).
- fulva** Roger. Vt. s. to Fla., w. to Nebr., Colo., La. Ecology: Nests in rotting wood such as logs and stumps or in soil under stones or other objects. Food consists mostly of live and dead insects. Temporary host of *A. tennesseensis* (Mayr) and possibly of *A. mariae* Forel.  
*Aphaenogaster fulva* Roger, 1863. Berlin Ent. Ztschr. 7:190. ♀.  
*Aphaenogaster fulva* var. *rubida* Enzmann, 1947. N. Y. Ent. Soc., Jour. 55:147. ♀.
- Biology:** Wheeler, 1917. Conn. State Geol. and Nat. Hist. Survey Bul. 22:586. —Wheeler, 1910. Ants, pp. 81, 83, 206, 448, 453. —Gregg, 1963. Ants of Colo., pp. 336-337, 339. —Smith, 1965. U. S. Dept. Agr., Tech. Bul. 1326:24-25.
- huachucana crinimera** Cole. N. Mex. (Bandelier Natl. Mon.).  
*Aphaenogaster (Allomyrma(!)) huachucana crinimera* Cole, 1953. Tenn. Acad. Sci., Jour. 28:82. ♀, ♀, ♂.
- huachucana huachucana** Creighton. Colo., Ariz.  
*Aphaenogaster (Attomyrma) huachucana* Creighton, 1934. Psyche 41:189. ♀.
- Taxonomy:** Creighton, 1951. Psyche 58:89-99 (each caste).
- Biology:** Gregg, 1963. Ants of Colo., pp. 338-340.
- lamellidens** Mayr. N. Y. s. to Fla., w. to Ill., Mo., Tex. Ecology: Typically nests in stumps and logs and feeds on live and dead insects.  
*Aphaenogaster lamellidens* Mayr, 1886. Zool.-Bot. Gesell. Wien, Verh. 36:443, 445. ♀, ♀, ♂.  
*Aphaenogaster lamellidens* var. *nigripes* Smith, 1923. Ent. News 34:308. ♀.
- Taxonomy:** Cole, 1940. Amer. Midland Nat. 24:50, 52.
- Biology:** Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21:383. —Smith, 1918. Ent. News 29:21. —Smith, 1924. Ent. News 35:51. —Smith, 1928. Ent. News 39:246. —Dennis, 1938. Ent. Soc. Amer., Ann. 31:285, 304. —Smith, 1965. U. S. Dept. Agr., Tech. Bul. 1326:20-21.
- mariae** Forel. N. Y. s. to Fla., w. to Iowa, Kans. Ecology: Probably a temporary parasite. Host: *Aphaenogaster fulva* Roger.  
*Aphaenogaster mariae* Forel, 1886. Soc. Ent. de Belg., Bul. 30:41. ♀.
- Taxonomy:** Wheeler, 1917. Conn. State Geol. and Nat. Hist. Survey Bul. 22:585. —Buren, 1944. Iowa State Col., Jour. Sci. 18:284 (female).
- Biology:** Wheeler, 1910. Ants, pp. 151, 448. —Wesson and Wesson, 1940. Amer. Midland Nat. 24:93.
- megommata** Smith. Oreg., Nev., Ariz., Calif. Ecology: A crepuscular and nocturnal forager.  
*Aphaenogaster (Attomyrma) megommatus* Smith, 1963. N. Y. Ent. Soc., Jour. 71:244-246. ♀.
- Taxonomy:** Cole, 1966. Brigham Young Univ., Sci. Bul., Biol. Ser. 7(3):9-11 (female, male). —Wheeler and Wheeler, 1972. Ga. Ent. Soc., Jour. 7:238 (larva).
- miamiana** Wheeler. Fla., Ala., Miss. Ecology: Possibly arboreal, nesting in branches.  
*Aphaenogaster (Attomyrma) texana* var. *miamiana* Wheeler, 1932. N. Y. Ent. Soc., Jour. 40:5. ♀, ♀, ♂.
- mutica** Pergande. Tex. (?); Mexico (Lower Calif.). Ecology: Recorded from Brownsville, Tex., but may not occur in U. S.  
*Aphaenogaster mutica* Pergande, 1895. Calif. Acad. Sci., Proc. 5:891. ♀.

- patruelis** Forel. Calif. (Coastal Islands); Mexico (Lower Calif., Guadeloupe Is., St. Nicholas Is.).  
*Aphaenogaster patruelis* Forel, 1886. Soc. Ent. de Belg., Ann. 30:41. ♀.  
*Stenamma (Aphaenogaster) patruelis bakeri* Wheeler, 1904. Amer. Mus. Nat. Hist., Bul. 20:270. ♀.  
*Aphaenogaster patruelis willowsi* Wheeler, 1933. Calif. Acad. Sci., Proc. 21:64. ♀.
- Taxonomy: Wheeler, 1934. Pan-Pacific Ent. 10:133.
- rudis picea** (Emery). N. S. s. to N. C. Ecology: Habits are similar to *rudis rudis* (Emery), but *rudis picea* is normally found at higher elevations. Temporary host of *A. tennesseensis* (Mayr).  
*Stenamma (Aphaenogaster) fulvum aquia* var. *piceum* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:305. ♀, ♀, ♂.
- Taxonomy: Wheeler and Wheeler, 1953. Ent. Soc. Wash., Proc. 55:57-60 (larva).
- Biology: Wheeler, 1910. Ants, pp. 195, 282, 447-448, 453. —Dennis, 1938. Ent. Soc. Amer., Ann. 31:286-287, 305. —Wesson and Wesson, 1940. Amer. Midland Nat. 24:94. —Haskins, 1960. N. Y. Ent. Soc., Jour. 68:66-67 (longevity of fertile females).
- rudis rudis** (Emery). Mass. s. to Fla., w. to Wyo., Colo. Ecology: A common and highly adaptable species, nesting in soil, under stones or logs, in decaying wood, leaf litter, hollow stems of plants, or under bark at bases of trees. Food consists of insects, seeds, and pollen of ground nesting bees. Host of temporary ant parasite *Aphaenogaster tennesseensis* (Mayr).  
*Stenamma (Aphaenogaster) fulva aquia* var. *rude* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:305. ♀, ♀.
- Taxonomy: Wheeler and Wheeler, 1953. Ent. Soc. Wash., Proc. 55:56 (larva).
- Biology: Wesson and Wesson, 1940. Amer. Midland Nat. 24:90, 94. —Talbot, 1951. Ent. Soc. Amer., Ann. 44:302-307. —Brown, 1958. Psyche 65:39-40 (nest raided by *Formica subintegra* Emery). —Gregg, 1963. Ants of Colo., pp. 340-342. —Bobb, 1965, Jour. Econ. Ent. 58:925 (predator of *Neodiprion pratti pratti* (Dyar)). —Smith, 1965. U. S. Dept., Agr., Tech. Bul. 1326:21-22.
- Morphology: Gotwald, 1969. N. Y. (Cornell) Agr. Expt. Sta., Mem. 408:99-112 (mouthparts).
- subterranea occidentalis** (Emery). B. C. s. to Nev., Calif. *A. subterranea subterranea* (Latreille) occurs in the Mediterranean region and central Europe.  
*Stenamma (Aphaenogaster) subterraneum occidentale* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:301. ♀.  
*Aphaenogaster subterranea borealis* Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34:412. ♀.  
*Aphaenogaster subterranea valida* var. *manni* Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52:516. ♀.
- Taxonomy: Cole, 1942. Amer. Midland Nat. 28:363. —Wheeler and Wheeler, 1953. Ent. Soc. Wash., Proc. 55:61 (larva).
- Biology: Mallis, 1941. South. Calif. Acad. Sci., Bul. 40:7. —Bruniquel, 1970. Insectes Sociaux 17:245-252 (biology of *A. subterranea* in Europe).
- subterranea valida** Wheeler. S. Dak. to B. C., s. to Colo., Utah. Ecology: Prefers to nest under stones in moist, shady foothill canyons. Intergrades in northern part of range with subsp. *occidentalis*.  
*Aphaenogaster subterranea valida* Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34:411. ♀, ♀, ♂.
- Biology: Gregg, 1947. Colo. Univ., Studies (ser. D) 2:393. —Gregg, 1963. Ants of Colo., pp. 342-344.
- tennesseensis** (Mayr). Que., Ont. s. to Fla., w. to Minn., S. Dak., Nebr., Kans., Okla. Ecology: In early stages of colony formation, probably a temporary parasite in ground nests of other *Aphaenogaster* species. Lives in ground nests only when females occur in nests of *rudis* and *picea*, otherwise it is exclusively a wood nesting ant. Host: *Aphaenogaster fulva* Roger, *A. rudis picea* (Emery), *A. rudis rudis* (Emery).  
*Atta tennesseensis* (!) Mayr, 1862. Zool.-Bot. Gesell. Wien, Verh. 12:743. ♀.  
*Atta laevis* Mayr, 1862. Zool.-Bot. Gesell. Wien, Verh. 12:743. ♀.

*Myrmica subrubra* Buckley, 1867. Ent. Soc. Phila., Proc. 6:336. ♀, "♀" = ♂.  
*Stenamma (Aphaenogaster) tenesseeense* (!) var. *ecalcaratum* Emery, 1895. Zool. Jahrb.,  
 Abt. f. System. 8:301. ♀.

Taxonomy: Wheeler, 1917. Conn. State Geol. and Nat. Hist. Survey Bul. 22:585-586.  
 —Wheeler and Wheeler, 1953. Ent. Soc. Wash., Proc. 55:61-62 (larva). —Francoeur and  
 Beique, 1968. Nat. Canad. 95:227 (distribution).

Biology: Wheeler, 1910. Ants, pp. 114, 447-448, 450. —Dennis, 1938. Ent. Soc. Amer., Ann.  
 31:287-288. —Wesson and Wesson, 1940. Amer. Midland Nat. 24:90, 94. —Smith, 1965. U. S.  
 Dept. Agr., Tech. Bul. 1326:23-24.

**texana carolinensis** Wheeler. S. Va. to n. Ala. Ecology: Nests are in both wood and soil.  
*Aphaenogaster texana* var. *carolinensis* Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34:414.  
 ♀, ♀.

Taxonomy: Smith, 1931. Ent. News 42:17.

Biology: Dennis, 1938. Ent. Soc. Amer., Ann. 31:287, 305.

**texana texana** (Emery). N. C., Tenn. s. to Fla., w. to Kans., Ariz.

*Stenamma (Aphaenogaster) fulvum aquia* var. *texanum* Emery, 1895. Zool. Jahrb., Abt. f.  
 System. 8:306. ♀.

*Aphaenogaster texana* var. *furvescens* Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34:413.  
 ♀, ♀.

*Aphaenogaster (Deromyrma) Silvestrii* Menozzi, 1929. Bol. Lab. Zool. Gen. e Agr. Portici  
 22:282. ♀, ♀.

Taxonomy: Creighton, 1934. Psyche 41:192. —Wheeler and Wheeler, 1953. Ent. Soc. Wash.,  
 Proc. 55:62 (larva).

**treatae pluteicornis** Wheeler and Wheeler. Ala. w. to Okla., Tex.

*Aphaenogaster treatae pluteicornis* Wheeler and Wheeler, 1934. Psyche 41:7, 12. ♀, ♀, ♂.

*Aphaenogaster treatae pluteicornis* var. *oklahomensis* Wheeler and Wheeler, 1934. Psyche  
 41:10, 12. ♀, ♀.

Taxonomy: Wheeler and Wheeler, 1953. Ent. Soc. Wash., Proc. 55:62 (larva).

**treatae treatae** Forel. Ont. s. to Fla., w. to Mich., Ohio, Ill., Ala. Ecology: Nests are in soil  
 usually in open areas.

*Aphaenogaster treatae* Forel, 1886. Soc. Ent. de Belg., Bul. 30:40-41. ♀, ♀, ♂.

*Aphaenogaster treatae wheeleri* Mann, 1915. Psyche 22:51. ♀, ♀.

*Aphaenogaster treatae pluteicornis* var. *alabamensis* Wheeler and Wheeler, 1934. Psyche  
 41:10. ♀, ♀.

Taxonomy: Wheeler, 1917. Conn. State Geol. and Nat. Hist. Survey Bul. 22:585. —Wheeler,  
 1919. Psyche 26:50.

Biology: Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21:303. —Wheeler, 1910. Ants, pp. 151,  
 200. —Talbot, 1954. Mich. Univ., Contrib. Lab. Vertebr. Biol. 69:1-9. —Talbot, 1966. Kans.  
 Ent. Soc., Jour. 39:67-77 (flights).

**uinta** Wheeler. Colo., Idaho, Utah, Nev. Ecology: Nests are in fully exposed areas of great  
 aridity.

*Aphaenogaster uinta* Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52:517. ♀, ♀, ♂.

Taxonomy: Cole, 1942. Amer. Midland Nat. 28:363-364.

Biology: Cole, 1934. Psyche 41:223. —Gregg, 1963. Ants of Colo., pp. 344-345, 347.

#### UNPLACED TAXA OF APHAENOGASTER

According to Creighton (1950, Harvard Univ., Mus. Comp. Zool., Bul.) the following forms  
 were described from minims only, and it is not possible to determine what they actually  
 represent.

**aquia** (Buckley). N. Y., Va. In the early literature, this and *fulva aquia* (Buckley) were used  
 for what is currently called *rudis rudis* (Emery).

*Myrmica (Monomarium* (?) *aquia* Buckley, 1867. Ent. Soc. Phila., Proc. 6: 341. ♀, ♀.

**fulva aquia** var. **pusilla** (Emery). D. C.

*Stenamma (Aphaenogaster) fulvum aquia* var. *pusillum* Emery, 1895. Zool. Jahrb., Abt. f. System. 8: 306. ♀.

**texana nana** Wheeler. Fla. (Gainesville).

*Aphaenogaster (Attomyrma) texana nana* Wheeler, 1932. N. Y. Ent. Soc., Jour. 40: 6. ♀.

**texana punctithorax** Cole. Tenn. (Gregory's Bald, Great Smoky Mtn. Natl. Pk.).

*Aphaenogaster texana punctithorax* Cole, 1938. Amer. Midland Nat. 19: 239. ♀.

### Genus VEROMESSOR Forel

*Novomessor* subg. *Veromessor* Forel, 1917. Soc. Vaud. des Sci. Nat., Bul. 51:235.

Type-species: *Aphaenogaster andrei* Mayr. Desig. by Emery, 1921.

*Veromessor* subg. *Lobognathus* Enzmann, 1947. N. Y. Ent. Soc., Jour. 55:152. Nomen nudum.

These are harvester ants, most common in the arid Southwest. They feed on seeds and other Arthropods and usually nest in exposed soil where the nests may or may not be marked with a small crater or piles of chaff from seeds stored in the nest. They are docile ants which seldom sting.

Revision: Wheeler and Creighton, 1934. Amer. Acad. Arts and Sci., Proc. 69:354-387.

Taxonomy: Smith, 1956. Pan-Pacific Ent. 32:36-37 (key to workers of U. S. species).

—Wheeler and Wheeler, 1956. Psyche 63:142-143 (larvae). —Wheeler and Wheeler, 1972. Ga. Ent. Soc., Jour. 7:240 (larvae).

Biology: Creighton, 1953. Amer. Mus. Novitates 1612:1-18. —Went, Wheeler, and Wheeler, 1972. BioScience 22:82-88 (feeding and digestion).

**andrei** (Mayr). Oreg., Nev., Ariz., Calif.; Mexico. Ecology: Found from sea level up to 3500 feet. Nests are in various types of soil and openings are surrounded by a circular disc or low, obscure crater.

*Aphaenogaster andrei* Mayr, 1886. Zool.-Bot. Gesell. Wien, Verh. 36:443, 448. ♀.

*Veromessor andrei flavus* Wheeler and Creighton, 1934. Amer. Acad. Arts and Sci., Proc. 69:361, 366. ♀.

*Veromessor andrei castaneus* Wheeler and Creighton, 1934. Amer. Acad. Arts and Sci., Proc. 69:361, 365. ♀.

Taxonomy: Emery, 1895. Zool. Jahrb., Abt. f. System. 8:306-307 (worker, female). —Wheeler and Wheeler, 1972. Ga. Ent. Soc., Jour. 7:240 (larva).

Biology: Wheeler, 1910. Ants, p. 280. —Cole, 1934. Ent. Soc. Amer., Ann. 27:398. —Mallis, 1941. South. Calif. Acad. Sci., Bul. 40:7. —Eckert and Mallis, 1937. Calif. Agr. Expt. Sta. Cir. 342:24 (economics). —Creighton, 1953. Amer. Mus. Novitates 1612:2-4. —McCluskey, 1958. Science 128:536-537 (daily rhythm of male). —Wheeler and Wheeler, 1973. Ants of Deep Canyon, pp. 65-67.

**chamberlini** (Wheeler). Calif. (coastal islands and mainland).

*Messor chamberlini* Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34:410. ♀.

Taxonomy: Wheeler and Wheeler, 1972. Ga. Ent. Soc., Jour. 7:240 (larva).

**lariversi** Smith. Nev., Calif. Ecology: Nests are in exposed soil or gravel, and may be marked by one or more small circular craters several inches in diameter.

*Veromessor lariversi* Smith, 1951. Great Basin Nat. 11:94-96. ♀.

Taxonomy: Cole, 1955. Tenn. Acad. Sci., Jour. 30:51-52 (female).

Biology: Creighton, 1953. Amer. Mus. Novitates 1612:5-6. —Cole, 1963. Ent. Soc. Amer., Ann. 56:680-682. —Cole, 1966. Brigham Young Univ., Sci. Bul., Biol. Ser. 7(3):12.

**lobognathus** (Andrews). Southwest. N. Dak., Colo., Nev. Ecology: Colonies are populous and nests are under large stones.

*Messor lobognathus* Andrews, 1916. Psyche 23:82. ♀.

Taxonomy: Wheeler and Wheeler, 1956. Psyche 63:143-145 (larva). —Cole, 1963. Ent. Soc. Amer., Ann. 56:680-682 (each caste).



- Biology: Gregg, 1955. *Psyche* 62:45-52 (rediscovery). —Wheeler and Wheeler, 1956. *Psyche* 63:140-145 (in N. Dak.). —Wheeler and Wheeler, 1959. *Ent. Soc. Amer., Ann.* 52:176-179 (behavior, nest structure). —Wheeler and Wheeler, 1963. *Ants of N. Dak.*, pp. 123-125.  
 —Gregg, 1963. *Ants of Colo.*, pp. 354-356. —Wheeler and Wheeler, 1965. *Kans. Ent. Soc., Jour.* 38:55-61. —Cole, 1966. *Brigham Young Univ., Sci. Bul., Biol. Ser.* 7(3):12-13.
- pergandei** (Mayr). Ariz., Nev., Calif.; Mexico. Ecology: Nests are in exposed soil, usually with a single entrance which is surrounded by a crater of excavated soil. Workers are diurnal foragers and can remain active during periods of intense heat.  
*Aphaenogaster pergandei* Mayr, 1886. *Zool.-Bot. Gesell. Wien, Verh.* 36:444, 448. ♀.
- Taxonomy: Eckert and Mallis, 1937. *Calif. Agr. Expt. Sta. Cir.* 342:8, 25. —Cole, 1963. *Ent. Soc. Amer., Ann.* 56:681. —Wheeler and Wheeler, 1972. *Ga. Ent. Soc., Jour.* 7:240 (larva).
- Biology: Wheeler, 1910. *Ants*, pp. 16, 280. —Cole, 1937. *Ent. News* 48:101. —Mallis, 1941. *South. Calif. Acad. Sci., Bul.* 40:68. —Creighton, 1953. *Amer. Mus. Novitates* 1612:7-17. —Cole, 1966. *Brigham Young Univ., Sci. Bul., Biol. Ser.* 7(3):13-14. —Wheeler and Wheeler, 1965. *Kans. Ent. Soc., Jour.* 38:55 (habitat, harvesting habits, defense). —Wheeler and Wheeler, 1967. *Kans. Ent. Soc. Jour.* 40:238 (distribution and habitat). —Tevis, 1958. *Ecology* 39:695-704 (interrelations with some desert ephemerals). —Wheeler and Wheeler, 1973. *Ants of Deep Canyon*, pp. 67-72. —Clark and Comanor, 1973. *Amer. Midland Nat.* 90: 467-474 (quantitative examination of spring foraging). —Wheeler and Rissing, 1975. *Pan-Pacific Ent.* 51: 205-216 (nest). —Wheeler and Rissing, 1975. *Pan-Pacific Ent.* 51: 303-314 (behavior). —Rissing and Wheeler, 1976. *Pan-Pacific Ent.* 52: 63-72 (foraging responses to changes in seed production).
- smithi** Cole. Nev. (Mercury, Nye Co.), Ariz. Ecology: Nests are in fully exposed areas, each with a small circular crater of soil about their entrance.  
*Veromessor smithi* Cole, 1963. *Ent. Soc. Amer., Ann.* 56:678-680. ♀, ♀, ♂.
- Taxonomy: Wheeler and Wheeler, 1972. *Ga. Ent. Soc., Jour.* 7:240 (larva).
- Biology: Cole, 1966. *Brigham Young Univ., Sci. Bul., Biol. Ser.* 7(3):14.
- stoddardi chicoensis** Smith. Calif. (Chico). Ecology: The type series was found beneath a large stone.  
*Veromessor stoddardi chicoensis* Smith, 1956. *Pan-Pacific Ent.* 32:36-38. ♀.
- stoddardi stoddardi** (Emery). S. Calif.; Mexico. Ecology: Nests have been found in hard clay soil, each with several openings situated at the bottom of a shallow depression and without excavated soil.  
*Stenammas (Messor) stoddardi* Emery, 1895. *Zool. Jahrb., Abt. f. System.* 8:307. ♀.
- Biology: Wheeler, 1910. *Ants*, p. 280. —Creighton, 1953. *Amer. Mus. Novitates* 1612:17-18.

### Genus PHEIDOLE Westwood

- Pheidole* Westwood, 1841. *Ann. and Mag. Nat. Hist.* 6:87.  
 Type-species: *Atta providens* Sykes. Monotypic.
- Oecophthora* Heer, 1852. *Naturf. Gesell. in Zurich, Neujahrsbl.* 54:11, 15.  
 Type-species: *Oecophthora pusilla* Heer. Monotypic.
- Ischnomyrmez* Mayr, 1862. *Zool.-Bot. Gesell. Wien, Verh.* 12:738.  
 Type-species: *Myrmica longipes* Smith. Monotypic.
- Leptomyrma* Motschulsky, 1863. *Soc. Imp. Nat. Moscou, Bul.* 36:17.  
 Type-species: *Leptomyrma gracilipes* Motschulsky. Monotypic.
- Pheidolacanthinus* Smith, 1864. *Linn. Soc. London, Jour., Zool.* 8:75.  
 Type-species: *Pheidolacanthinus armatus* Smith. Monotypic.
- Pheidole* subg. *Ceratopheidole* Pergande, 1895. *Calif. Acad. Sci., Proc.* 5:889.  
 Type-species: *Pheidole (Ceratopheidole) granulata* Pergande. Monotypic.
- Phidole* Bingham, 1903. *Fauna Brit. India, Hym.* 2:220. Variant spelling.
- Epipheidole* Wheeler, 1903. *Amer. Mus. Nat. Hist., Bul.* 19:664.  
 Type-species: *Epipheidole inquilina* Wheeler. Monotypic.
- Sympheidole* Wheeler, 1904. *Amer. Mus. Nat. Hist., Bul.* 20:1, 7.  
 Type-species: *Sympheidole elecebra* Wheeler. Monotypic.
- Phidola* Schulz, 1906. *Spolia Hym.*, p. 155. Emend.

- Allophheidole* Forel, 1912. Soc. Ent. de Belg., Mem. 19:237.  
Type-species: *Pheidole kingi* Andre. Desig. by Wheeler, 1913.
- Decapheidole* Forel, 1912. Soc. Ent. de Belg., Mem. 19:237.  
Type-species: *Pheidole perpusilla* Emery. Desig. by Wheeler, 1913.
- Isopheidole* Forel, 1912. Rev. Suisse de Zool. 20:765.  
Type-species: *Myrmica longipes* Smith. Monotypic.
- Elasmopheidole* Forel, 1913. Zool. Jahrb., Abt. f. System. 36:43.  
Type-species: *Pheidole aberans* Mayr. Desig. by Emery, 1922.
- Cardiopheidole* Wheeler, 1914. N. Y. Ent. Soc., Jour. 22:48-51.  
Type-species: *Pheidole vasliti* Pergande. Orig. desig.
- Anergatides* Wasmann, 1915. Ent. Mitt. 4:281. Uncertain syn.  
Type-species: *Anergatides kohli* Wasmann. Monotypic.
- Macropheidole* Emery, 1915. Soc. Ent. de France, Bul. p. 190.  
Type-species: *Pheidole fimbriata* Roger. Monotypic.
- Scrobopheidole* Emery, 1915. Soc. Ent. de France, Bul. p. 190.  
Type-species: *Pheidole scrobifera* Emery. Monotypic.
- Stegopheidole* Emery, 1915. Soc. Ent. de France, Bul. p. 190.  
Type-species: *Pheidole (Elasmopheidole) upeneci* Forel. Monotypic.
- Trachypheidole* Emery, 1915. Soc. Ent. de France, Bul. p. 190.  
Type-species: *Pheidole bicornis* Forel. Orig. desig.
- Parapheidole* Emery, 1915. R. Accad. delle Sci. dell'Ist. Bologna, p. 68.  
Type-species: *Aphaenogaster oculata* Emery. Monotypic.
- Pheidole* subg. *Electropheidole* Mann, 1921. Harvard Univ., Mus. Comp. Zool., Bul. 64:438.  
Type-species: *Pheidole (Electropheidole) roosevelti* Mann. Desig. by Donisthorpe, 1943.
- Bruchomyrma* Santschi, 1922. Soc. Cient. Argentina, An. 94:248. Uncertain syn.  
Type-species: *Bruchomyrma acutidens* Santschi. Monotypic.
- Cephalomorium* Forel, 1922. Rev. Suisse de Zool. 30:91.  
Type-species: *Tetramorium (Cephalomorium) bahai* Forel. Monotypic.
- Hendecapheidole* Wheeler, 1922. Amer. Mus. Novitates 96:3.  
Type-species: *Pheidole tachigaliae* Wheeler. Orig. desig.
- Gallardomyrma* Bruch, 1932. La Plata Mus., Rev. 33:271.  
Type-species: *Gallardomyrma argentina* Bruch. Orig. desig.
- Conothorax* Karawajew, 1935. Treubia 15:75. Preocc. by Jekel, 1854.  
Type-species: *Conothorax bilobum* Karawajew. Monotypic.
- Conothoracoides* Strand, 1935. Folia Zool. Hydrobiol. 8:176. N. name for *Conothorax* Karavaiev.
- Eriopheidole* Kusnezov, 1952. Mus. de Entre Rios, Mem. 29:5.  
Type-species: *Eriopheidole symbiotica* Kusnezov. Orig. desig.

A large genus of harvesting ants for which most species are found in the arid Southwest. Most species have a dimorphic worker caste with majors or soldiers and minors which are not connected by intermediate forms. Only a few species are polymorphic with intermediate sized workers. The soldier is characteristic in having an enormous head, way out of proportion to the rest of the body, and may function as a seed husker.

Most species harvest seeds for food and chaff piles are sometimes found around the entrances to the nests. Nests may have craterlike excavations when in exposed soil, or nests may be under stones or other objects and sometimes in rotten wood. Though the main diet normally consists of seeds, most species also feed on other animal food. Most colonies are small with 300 or fewer individuals.

This is a huge cosmopolitan genus for which few satisfactory subdivisions have been made. A few species had been segregated into subgenera or closely related genera, but the bulk of the species always remained in the subgenus *Pheidole*. Emery (1921) attempted a group arrangement for this large subgenus, but this has met with little acceptance in recent years. It is now the trend to thrust all species into a single unit until satisfactory divisions can be made. The arrangement of this genus essentially follows the generic synonymy by Brown (1973) and the treatment of the genus by Gregg (1958).

Revision: Mayr, 1870. Zool.-Bot. Gesell. Wien, Verh. 20:979-989. —Mayr, 1887. Zool.-Bot. Gesell. Wien, Verh. 37:582-608. —Emery, 1895. Zool. Jahrb., Abt. f. System. 8:288-297. —Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:431-478. —Gregg, 1958. N. Y. Ent. Soc., Jour. 66:7-48 (key to and list of species).

Taxonomy: Emery, 1921. In Wytsman, Gen. Ins., fasc. 174:77-111 (groups). —Wheeler and Wheeler, 1953. Ent. Soc. Wash., Proc. 55:70-80 (larvae). —Smith, 1953. N. Y. Ent. Soc., Jour. 61:143 (*Ceratopheidole*). —Creighton and Gregg, 1955. Colo. Univ. Studies, Biol. Ser. 3:1-46. —Creighton, 1957. N. Y. Ent. Soc., Jour. 65:203-212 (*vasliti* complex). —Cole, 1965. Ent. Soc. Amer., Ann. 58:173-175 (*Epipheidole*). —Brown, 1973. In Meggers, et al., Tropical forest ecosystems in Afr. and S. Amer., pp. 178-185 (generic syn.).

Biology: Weber, 1948. Ent. News 59:31-35 (food of larvae and adults). —Szlep-Fessel, 1970. Insectes Sociaux 17:233-244 (regulatory mechanism in mass foraging and recruitment of soldiers).

**anastasii** Emery. S. Fla.; Mexico, Central Amer. Probably introduced. Reported from greenhouses in various parts of the East, but only established in southern Fla. *Pheidole anastasii* Emery, 1896. Soc. Ent. Ital., Bol. 28:76. ♀, ♂.

Taxonomy: Forel, 1901. Naturhist. Mus. Hamburg Mitt. 18:78 (female).

Biology: Wheeler, 1932. N. Y. Ent. Soc., Jour. 40:6. —Smith, 1933. Fla. Ent. 17:23.

**bahai** (Forel). N. C. (Façons).

*Tetramorium (Cephalomorium) bahai* Forel, 1922. Rev. Suisse de Zool. 30:91. ♀.

Taxonomy: Smith, 1955. Brooklyn Ent. Soc., Bul. 50:99 (correct taxonomic placement).

**barbata** Wheeler. W. Ariz., s. Nev., s.e. Calif. Ecology: In small crater nests in desert areas. *Pheidole barbata* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:448. ♀, ♂.

Biology: Mallis, 1941. South. Calif. Acad. Sci., Bul. 40:68. —Creighton and Gregg, 1955. Colo. Univ. Studies, Biol. Ser. 3:1-3. —Wheeler and Wheeler, 1973. Ants of Deep Canyon, p. 75.

**bicarinata bicarinata** Mayr. Mich. to Tenn., w. to N. Dak., Wyo., Colo. Ecology: Found in grasslands where nests are usually under objects.

*Pheidole bicarinata* Mayr, 1870. Zool.-Bot. Gesell. Wien, Verh. 20:982, 989. ♂.  
*Pheidole hayesi* Smith, 1924. Ent. News 35:251. ♀, ♂.

Biology: Hayes, 1925. Ent. News 36:42. —Talbot, 1934. Ecology 15:418, 420, 422. —Buren, 1944. Iowa State Col., Jour. Sci. 18:286. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 126-127. —Gregg, 1963. Ants of Colo., pp. 408-409.

**bicarinata longula** Emery. N. Y., N. Dak., w. Tex., Colo., N. Mex. Ecology: Nests may be in sand or under stones.

*Pheidole vinelandica* var. *longula* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:289, 292. ♀, ♂.

Taxonomy: Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:453-454. —Cole, 1956. Tenn. Acad. Sci., Jour. 31:112. —Gregg, 1958. N. Y. Ent. Soc., Jour. 65:37.

Biology: Davis and Bequaert, 1922. Brooklyn Ent. Soc., Bul. 17:9. —Wheeler and Wheeler, 1963. Ants of N. Dak., p. 127. —Gregg, 1963. Ants of Colo., pp. 408, 410.

**bicarinata paiute** Gregg. Nev., s. Calif. Ecology: Nests are beneath stones or with craters. *Pheidole bicarinata paiute* Gregg, 1958. N. Y. Ent. Soc., Jour. 66:17-18. ♀, ♂.

Biology: Cole, 1966. Brigham Young Univ., Sci. Bul., Biol. Ser. 7(3):15. —Wheeler and Wheeler, 1973. Ants of Deep Canyon, pp. 80-81.

**bicarinata vinelandica** Forel. N. Y. to Fla., w. to N. Dak., Utah, Ariz. Ecology: Nests in rotten logs, exposed soil, or under objects in grassy areas.

*Pheidole bicarinata* race *vinelandica* Forel, 1886. Soc. Ent. de Belg., Ann. 30:45. ♀, ♂, ♂.

*Pheidole vinelandica laeviuscula* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:289, 292. ♀, ♂.

*Pheidole vinelandica buccalis* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:454. ♀, ♂, ♀.

*Pheidole vinelandica longula* var. *castanea* Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34:405. ♀, ♂. Preocc. by Smith, 1858.

*Pheidole (Allophidole) vinelandica* var. *nebrascensis* Forel, 1922. Rev. Suisse de Zool. 30:92. ♀, ♂, ♀.

*Pheidole vinelandica longula* var. *huachucana* Smith, 1951. In Muesebeck, et al., U. S. Dept. Agr., Agr. Monog. 2:805. N. name for *castanea* Wheeler.

Taxonomy: Gregg, 1958. N. Y. Ent. Soc., Jour. 66:18, 36.

Biology: Wheeler, 1906. Amer. Mus. Nat. Hist., Bul. 22:336-337. —Cole, 1937. Ent. News 48:100. —Wesson and Wesson, 1940. Amer. Midland Nat. 24:92. —Cole, 1953. Tenn. Acad. Sci., Jour. 28:297. —Reid and Nugara, 1961. Jour. Parasitology 47:885-889 (as intermediate hosts of a turkey tapeworm). —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 127-128. —Gregg, 1963. Ants of Colo., pp. 410, 412-413. —Smith, 1965. U. S. Dept. Agr., Tech. Bul. 1326:25-26.

**californica californica** Mayr. Calif. (San Francisco region southwards). Ecology: Nests are found under objects, in oak galls, or in sandy soil.

*Pheidole californica* Mayr, 1870. Zool.-Bot. Gesell. Wien, Verh. 20:981, 984, 987. ♀, ♂.

*Pheidole californica* var. *incenata* Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34:407. ♀, ♂.

*Pheidole californica* var. *satura* Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34:407. ♀, ♂.

Taxonomy: Wheeler and Wheeler, 1972. Ga. Ent. Soc., Jour. 7:243 (larva).

Biology: Cole, 1934. Ent. Soc. Amer., Ann. 27:395-397. —Mallis, 1941. South. Calif. Acad. Sci., Bul. 40:68-69.

**californica oregonica** Emery. Idaho, Wash., Oreg., n. Calif.

*Pheidole oregonica* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:288, 291. ♀, ♂.

*Pheidole californica* var. *shoshoni* Cole, 1933. Ent. Soc. Amer., Ann. 26:618. ♀, ♂.

*Pheidole californica* var. *hagermani* Cole, 1936. Canad. Ent. 68:35. ♀, ♂.

Taxonomy: Gregg, 1958. N. Y. Ent. Soc., Jour. 66:19.

Biology: Mallis, 1941. South. Calif. Acad. Sci., Bul. 40:69. —Cole, 1942. Amer. Midland Nat. 28:362.

**californica pyramidentis** Emery. Nev. (Pyramid Lake).

*Pheidole californica nevadensis* Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34:408. ♀, ♂, ♀. Preocc. by Forel, 1901.

*Pheidole californica pyramidentis* Emery, 1922. In Wytzman, Gen. Ins., fasc. 174:105. N. name for *nevadensis* Wheeler.

**casta** Wheeler. Tex. (Canyon of the Rio Grande, Langtry).

*Pheidole casta* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:454. ♀, ♂.

**cerebrosior** Wheeler. N. Mex., Ariz., Calif.; Mexico. Ecology: Nests more frequently in mountain canyons than on open desert and the species seems to prefer the evergreen oak association.

*Pheidole vinelandica cerebrosior* Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34:405. ♀, ♂.

Taxonomy: Creighton and Gregg, 1955. Colo. Univ. Studies, Biol. Ser. 3:3-5.

**ceres** Wheeler. Tex., Colo., N. Mex., Ariz. Ecology: Host of the permanently parasitic ant *P. elecebra*. Parasitized colonies have been found to contain only soldiers and workers of *ceres*. *Ceres* nests under stones in rather dry, sunny localities at altitudes of 5,000 to 9,000 ft. and is a seed-storing form. Parasite: *Pheidole elecebra* (Wheeler).

*Pheidole ceres* Wheeler, 1904. Amer. Mus. Nat. Hist., Bul. 20:10. ♀, ♂, ♀, ♂.

Taxonomy: Gregg, 1958. N. Y. Ent. Soc., Jour. 66:20, 35.

Biology: Wheeler, 1919. Amer. Phil. Soc., Proc. 58:25. —Wheeler, 1923. Social Life Among the Insects, p. 219. —Wheeler, 1910. Ants, pp. 279, 497. —Cole, 1953. Tenn. Acad. Sci., Jour. 28:297. —Gregg, 1963. Ants of Colo., pp. 413-415.

**clementensis** Gregg. Calif. (San Clemente Is., Los Angeles Co.; Orange Co.; San Diego Co.).

*Pheidole clementensis* Gregg, 1969. Ent. News 80: 93-97. ♀, ♂.

**clydei** Gregg. N. Mex., Ariz., Nev., s. Calif. Ecology: Nests are found in and among rocks and boulders.

*Pheidole (Ceratothepidole) clydei* Gregg, 1950. N. Y. Ent. Soc., Jour. 58: 89. ♀.

Taxonomy: Gregg, 1953. Amer. Mus. Novitates 1673: 1 (soldier, distribution).

Biology: Creighton, 1964. *Psyche* 71: 169. —Wheeler and Wheeler, 1973. *Ants of Deep Canyon*, pp. 84-86.

**cockerelli** Wheeler. Okla., Tex., Colo., N. Mex., Ariz.

*Pheidole cockerelli* Wheeler, 1908. *Amer. Mus. Nat. Hist.*, Bul. 24: 464. ♀, ♂.

Biology: Gregg, 1963. *Ants of Colo.*, pp. 415-417.

**crassicornis** **crassicornis** Emery. N. C., Tenn., Ga. w. to Tex.

*Pheidole crassicornis* Emery, 1895. *Zool. Jahrb., Abt. f. System.* 8:289, 296. ♂.

*Pheidole crassicornis* var. *diversipilosa* Wheeler, 1908. *Amer. Mus. Nat. Hist.*, Bul. 24:467. ♀, ♂, ♀.

Taxonomy: Forel, 1901. *Soc. Ent. de Belg., Ann.* 45:350 (male).

Biology: Wheeler, 1904. *Amer. Mus. Nat. Hist.*, Bul. 20:302. —Smith, 1918. *Ent. News* 29:22.

**crassicornis** **tetra** Wheeler. Tex. w. to Ariz.

*Pheidole crassicornis porcula* var. *tetra* Wheeler, 1908. *Amer. Mus. Nat. Hist.*, Bul. 24:467. ♀, ♂.

**creightoni** Gregg. Oreg., Nev., n. Calif.

*Pheidole creightoni* Gregg, 1955. *Psyche* 62:19-28. ♀, ♀, ♂.

Taxonomy: Cole, 1957. *N. Y. Ent. Soc., Jour.* 65:131 (distribution).

**davisi** Wheeler. N. J. s. to N. C., n. Ala.

*Pheidole davisi* Wheeler, 1905. *Amer. Mus. Nat. Hist.*, Bul. 21:380. ♀, ♂.

Biology: Davis and Bequaert, 1922. *Brooklyn Ent. Soc.*, Bul. 17:8-9. —Bequaert, 1928. *N. Y. (Cornell) Agr. Expt. Sta., Mem.* 101:996.

**dentata** Mayr. Va. to Fla., w. to Ill., Kans, Tex. Ecology: Nests of small to large colonies are in exposed soil with a mound of excavated earth above it, under the cover of objects, or in rotting wood. Occasionally a house-infesting ant.

*Pheidole Morrisi* var. *dentata* Mayr, 1886. *Zool.-Bot. Gesell. Wien, Verh.* 36:457. ♀, ♂, ♂.

*Pheidole commutata* Mayr, 1886. *Zool.-Bot. Gesell. Wien, Verh.* 36:459. ♀, ♂.

*Pheidole dentata* var. *faisonsica* Forel, 1901. *Soc. Ent. de Belg., Ann.* 45:352. ♀, ♂.

*Leptothorax tennesseensis* Cole, 1938. *Amer. Midland Nat.* 19:238. ♀.

Taxonomy: Wheeler, 1908. *Amer. Mus. Nat. Hist.*, Bul. 24:460-461. —Wheeler and Wheeler, 1953. *Ent. Soc. Wash., Proc.* 55:71 (larva).

Biology: Mitchell and Pierce, 1912. *Ent. Soc. Wash., Proc.* 14:71. —Smith, 1924. *Ent. News* 35:77. —Dennis, 1938. *Ent. Soc. Amer., Ann.* 31:281, 304. —Cole, 1940. *Amer. Midland Nat.* 24:29, 44. —Van Pelt, 1950. *Ent. News* 61:161-163 (parasitism by an *Orasema* chalcid).

—Smith, 1965. *U. S. Dept. Agr., Tech. Bul.* 1326:27-28. —Wilson, 1975. *Science* 190: 798-800 (enemy specification in the alarm-recruitment system).

**dentigula** Smith. N. C., Tenn. s. to Fla., w. to La. Ecology: Nests in soil or in well-rotted stumps.

*Pheidole dentigula* Smith, 1927. *Ent. News* 38:310. ♀, ♂.

Taxonomy: Smith, 1928. *Ent. News* 39:245-246 (female). —Cole, 1940. *Amer. Midland Nat.* 24:42, 45. —Wheeler and Wheeler, 1960. *Ent. Soc. Wash., Proc.* 62:12 (larva).

Biology: Smith, 1944. *Fla. Ent.* 27:14.

**desertorum** Wheeler. W. Okla., w. Tex., N. Mex., Utah, Ariz., Nev. Ecology: Nests have been found beneath stones and as small crater mounds in sand.

*Pheidole desertorum* Wheeler, 1906. *Amer. Mus. Nat. Hist.*, Bul. 22:337. ♀, ♂, ♀, ♂.

*Pheidole desertorum* var. *comanche* Wheeler, 1906. *Amer. Mus. Nat. Hist.*, Bul. 22:339. ♀, ♂, ♀.

*Pheidole desertorum* var. *maricopa* Wheeler, 1906. *Amer. Mus. Nat. Hist.*, Bul. 22:339. ♀, ♂.

Taxonomy: Cole, 1942. *Amer. Midland Nat.* 28:362.

Biology: Cole, 1934. *Ent. Soc. Amer., Ann.* 27:397. —Cole, 1937. *Ent. News* 48:100. —Gregg, 1963. *Ants of Colo.*, pp. 417-419.

- elecebra** (Wheeler). Colo. Ecology: A permanent, workerless parasite in colonies of its host.  
Host: *Pheidole cecus* Wheeler.  
*Sympheidole elecebra* Wheeler, 1904. Amer. Mus. Nat. Hist., Bul. 20:8. ♀, ♂.
- Biology: Wheeler, 1910. Ants, p. 497. —Wheeler, 1923. Social Life Among the Insects, p. 219.  
—Gregg, 1963. Ants of Colo., pp. 429-431.
- flavens** Roger. Fla.; W. Indies, Central Amer. Possibly an adventive.  
*Pheidole flavens* Roger, 1863. Berlin. Ent. Ztschr. 7:198. ♀, ♂.
- Taxonomy: Gregg, 1958. N. Y. Ent. Soc., Jour. 66:45-46 (Fla. populations regarded as not quite typical representatives of *Pheidole flavens*).
- floridana constipata** Wheeler. Tex. (Austin and New Braunfels).  
*Pheidole constipata* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:468. ♀, ♂, ♀, ♂.
- floridana floridana** Emery. N. C. to Fla., w. to Tex.  
*Pheidole flavens floridana* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:289, 293. ♀, ♂, ♀.
- Pheidole laeta* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:470. ♀, ♂, ♀, ♂.
- Taxonomy: Gregg, 1958. N. Y. Ent. Soc., Jour. 66:35.
- gilvescens** Wheeler. Ariz., s. Nev., Calif. Ecology: Nests in soil in deserts, usually forms small craters.  
*Pheidole xerophila tucsonica* var. *gilvescens* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:448. ♀, ♂.
- Taxonomy: Creighton and Gregg, 1955. Colo. Univ. Studies, Biol. Ser. 3:5-7, 40.
- Biology: Cole, 1934. Ent. Soc. Amer., Ann. 27:397. —Cole, 1956. Tenn. Acad. Sci., Jour. 31:113.  
—Wheeler and Wheeler, 1973. Ants of Deep Canyon, p. 76.
- grundmanni** Smith. Utah (Ashley Cr. near Vernal).  
*Pheidole (Ceratopheidole) grundmanni* Smith, 1953. N. Y. Ent. Soc., Jour. 61:144-146. ♀.
- Biology: Gregg, 1963. Ants of Colo., pp. 426-427.
- humeralis** Wheeler. Tex. (Corsicana).  
*Pheidole humeralis* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:456. ♀, ♂.
- hyatti hyatti** Emery. Okla., Tex., Colo. w. to Nev., s. Calif.; Mexico.  
*Pheidole hyatti* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:289-290, 295. ♀, ♂.
- Pheidole hyatti* var. *ecitonodora* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:463. ♀, ♂, ♀, ♂.
- Taxonomy: Wheeler and Wheeler, 1953. Ent. Soc. Wash., Proc. 55:74 (larva). —Wheeler and Wheeler, 1972. Ga. Ent. Soc., Jour. 7:244 (larva).
- Biology: Essig, 1926. Ins. of West. N. Amer., p. 859. —Eckert and Mallis, 1937. Calif. Agr. Expt. Sta. Cir. 342:26. —Gregg, 1963. Ants of Colo., pp. 419-420. —Wheeler and Wheeler, 1973. Ants of Deep Canyon, pp. 79-80.
- hyatti solitanea** Wheeler. Calif. (coastal area in San Diego region).  
*Pheidole hyatti solitanea* Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34:409. ♀, ♂, ♀.
- inquilina** (Wheeler). Nebr., Colo., Nev. Ecology: An inquiline in nests of other ants. Host: *Pheidole pilifera pilifera* (Roger), *P. pilifera coloradensis* Emery.  
*Epipheidole inquilina* Wheeler, 1903. Amer. Mus. Nat. Hist., Bul. 19:664. Gynandromorph.
- Taxonomy: Wheeler, 1904. Amer. Mus. Nat. Hist., Bul. 20:15-17 (female, male). —Smith, 1940. Ent. Soc. Wash., Proc. 42:106-109 (worker). —Cole, 1965. Ent. Soc. Amer., Ann. 58:173-175 (worker, soldier; placement in *Pheidole*; biological notes).
- Biology: Wheeler, 1910. Ants, pp. 107, 113, 150, 156, 497-498. —Wheeler, 1923. Social Life Among the Insects, pp. 215-219. —Gregg, 1963. Ants of Colo., pp. 427-429. —Cole, 1966. Brigham Young Univ., Sci. Bul., Biol. Ser. 7(3):15.
- lamia** Wheeler. Ga., Miss., Tex. Ecology: Apparently hypogaecic, living under stones in small colonies. The phragmotic head of the soldier is a striking feature of this species.  
*Pheidole lamia* Wheeler, 1901. Amer. Nat. 35:534. ♀, ♂.
- Taxonomy: Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:477-478 (soldier, female.).

Biology: Wheeler, 1910. Ants, pp. 212, 248. —Smith, 1931. Ent. News 42:21-22. —Gregg, 1956. Ent. News 67:37-39 (also distribution).

**macclendoni** Wheeler. S. Tex. w. to Ariz.

*Pheidole macclendoni* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:450. ♀, ♂.

Taxonomy: Cole, 1957. N. Y. Ent. Soc., Jour. 65:130-131 (worker, soldier). —Gregg, 1958. N. Y. Ent. Soc., Jour. 66:46-47.

**marcidula** Wheeler. Tex. (Barton Cr., Austin).

*Pheidole marcidula* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:457. ♀, ♂.

**megacephala** (Fabricius). Fla.; W. Indies, Hawaii, and probably all tropical regions of the world. Introduced, probably native to Africa but spread by commerce throughout the world. Bigheaded ant.

*Formica megacephala* Fabricius, 1793. Ent. System. 2:361. ♂.

*Phidola megaloccephala* Schulz, 1906. Spolia Hym., p. 155. Emend.

Taxonomy: Smith, 1936. Puerto Rico Univ., Jour. Agr. 20:843-844. —Wheeler and Wheeler, 1953. Ent. Soc. Wash., Proc. 55:75 (larva). —Wilson and Taylor, 1967. Pacific Insects Monog. 14:46-48.

Biology: Illingsworth, 1916. Hawaii. Ent. Soc., Proc. 3:349-368. —Phillips, 1934. (Hawaii Univ.) Expt. Sta. Pineapple Prod. Coop. Assoc. Bul. 15:5-12. —Broekhuysen, 1948. Union So. Africa Dept. Agr. Bul. 266:1-40. —Brown, 1958. Acta Hym. 1:47. —Brown, 1959. Bul. Ent. Res. 50:523. —Weber, 1960. Ent. Soc. Wash., Proc. 62:232. —Taylor and Wilson, 1961. Psyche 68:143. —Kempf, 1962. Studia Ent. 5:18-19. —Haskins and Haskins, 1965. Ecology 46:737 (competition between *P. megacephala* and *Iridomyrmex humilis* (Mayr) in Bermuda). —Fluker, Huddleston, and Beardsley, 1968. Jour. Econ. Ent. 61:474. —Fluker and Beardsley, 1970. Ent. Soc. Amer., Ann. 63:1290-1296 (sympatric association with *Iridomyrmex humilis* and *Anoplolepis longipes* in Hawaii).

**metallescens metallescens** Emery. Fla. w. to Tex.

*Pheidole metallescens* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:289, 294. ♀.

Taxonomy: Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:476-477. —Wheeler and Wheeler, 1960. Ent. Soc. Wash., Proc. 62:12 (larva).

Biology: Smith, 1924. Ent. News 34:78 (as *splendidula*).

**metallescens splendidula** Wheeler. Southwest. Tex.

*Pheidole metallescens splendidula* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:474. ♀, ♂, ♀, ♂.

**micula** Wheeler. Ariz., s. Calif. Ecology: Nest was found under a stone.

*Pheidole californica micula* Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34:408. ♀, ♂.

Taxonomy: Gregg, 1958. N. Y. Ent. Soc., Jour. 66:33. —Wheeler and Wheeler, 1972. Ga. Ent. Soc., Jour. 7:244 (larva).

Biology: Wheeler and Wheeler, 1973. Ants of Deep Canyon, p. 80.

**militicida** Wheeler. N. Mex., Ariz.

*Pheidole militicida* Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34:398. ♀, ♂.

Taxonomy: Creighton and Gregg, 1955. Colo. Univ. Studies, Biol. Ser. 3:9-12 (female, male; biological notes).

Biology: Cole, 1934. Ent. Soc. Amer., Ann. 27:395. —Cole, 1953. Tenn. Acad. Sci., Jour. 28:298. —Creighton and Creighton, 1959. Psyche 66:1-12 (observations on habits in s. Ariz.).

**moerens** Wheeler. Fla., Ala. (Mobile); Puerto Rico. Apparently introduced.

*Pheidole moerens* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:136-138. ♀, ♂.

Taxonomy: Wheeler and Wheeler, 1972. Ga. Ent. Soc., Jour. 7:244 (larva). —Wojcik, Banks, and Buren, 1975. Coop. Econ. Ins. Rpt. 25 (49-52): 906 (first report in Fla.).

Biology: Smith, 1937. Puerto Rico Univ., Jour. Agr. 20:842-843.

**morrissi impexa** Wheeler. Okla., Tex.

*Pheidole morrissi* var. *impexa* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:461. ♀, ♂, ♀, ♂.

Biology: Lindquist, 1942. Jour. Econ. Ent. 35:850-852.

**morrisi morrisi** Forel. N. Y. to Fla., w. to Ill., La., Tex.

*Pheidole Morrisii* Forel, 1886. Soc. Ent. de Belg., Bul. 30:46. ♀, ♂.

*Pheidole morrisi* var. *Vanceae* Forel, 1901. Soc. Ent. de Belg., Ann. 45:351. ♀, ♂, ♀, ♂.

Taxonomy: Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:461. —Smith, 1924. Ent. News 35:53. —Wheeler and Wheeler, 1960. Ent. Soc. Amer., Ann. 53:12 (larva).

Biology: Wheeler, 1904. Amer. Mus. Nat. Hist., Bul. 20:302. —Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21:380. —Davis and Bequaert, 1922. Brooklyn Ent. Soc., Bul. 17:8-9.

**nuculiceps** Wheeler. Tex. (Canal River, New Braunfels).

*Pheidole nuculiceps* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:473. ♀, ♂.

**pilifera artemisia** Cole. Utah, Ariz.

*Pheidole pilifera artemisia* Cole, 1933. Ent. Soc. Amer., Ann. 26:616. ♀, ♂.

Taxonomy: Cole, 1938. Amer. Midland Nat. 20:372 (female). —Cole, 1952. Tenn. Acad. Sci., Jour. 27:280. —Gregg, 1955. Psyche 62:22-23.

Biology: Cole, 1942. Amer. Midland Nat. 28:362.

**pilifera coloradensis** Emery. N. Dak., Colo., N. Mex., Nev. Ecology: A harvester of seeds of various grasses; nests are usually under stones. Parasite: *Pheidole inquilina* (Wheeler).

*Pheidole pilifera* var. *coloradensis* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:288, 291. ♀, ♂.

*Pheidole pilifera coloradensis* var. *neomexicana* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:436. ♂.

Taxonomy: Cole, 1952. Tenn. Acad. Sci., Jour. 27:279. —Gregg, 1955. Psyche 62:22-23.

Biology: Wheeler, 1903. Amer. Mus. Nat. Hist., Bul. 19:666. —Wheeler, 1904. Amer. Mus. Nat. Hist., Bul. 20:16-17. —Wheeler, 1910. Ants, pp. 279, 498. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 128-130. —Gregg, 1963. Ants of Colo., pp. 419, 421-422. —Cole, 1966. Brigham Young Univ., Sci. Bul., Biol. Ser. 7(3):15.

**pilifera pacifica** Wheeler. Nev., Calif.

*Pheidole xerophila pacifica* Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34:404. ♀, ♂, ♀, ♂.

Taxonomy: Cole, 1952. Tenn. Acad. Sci., Jour. 27:279. —Gregg, 1955. Psyche 62:22-23.

**pilifera pilifera** (Roger). N. Y., Mass. s. to Fla., w. to N. Dak., Nebr., Kans. Ecology: A harvester of seeds; most nests have been found in exposed soil and have craterlike excavations. Parasite: *Pheidole inquilina* (Wheeler).

*Leptothorax pilifer* Roger, 1863. Berlin. Ent. Ztschr. 7:180. ♀.

*Pheidole pennsylvanica* Roger, 1863. Berlin. Ent. Ztschr. 7:199. ♀.

*Pheidole pilifera septentrionalis* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:436. ♂.

*Pheidole pilifera* var. *simulans* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:436. ♂.

Taxonomy: Cole, 1952. Tenn. Acad. Sci., Jour. 27:280. —Wheeler and Wheeler, 1953. Ent. Soc. Wash., Proc. 55:79 (larva). —Gregg, 1955. Psyche 62:22-23.

Biology: Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21:379-380. —Wheeler, 1910. Ants, pp. 152, 278. —Wesson and Wesson, 1940. Amer. Midland Nat. 24:92. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 130-131.

**pinealis** Wheeler. Tex.; Mexico. Ecology: Nests have been found under stones.

*Pheidole pinealis* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:459. ♀, ♂.

Taxonomy: Creighton and Gregg, 1955. Colo. Univ. Studies, Biol. Ser. 3:12-15 (also biological notes).

**porcula** Wheeler. W. Tex., Colo. (?).

*Pheidole crassicornis porcula* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:466. ♀, ♂.

**psammophila** Creighton and Gregg. Ariz., s. Calif.; Mexico. Ecology: Found in sandy areas at low elevations.

*Pheidole psammophila* Creighton and Gregg, 1955. Colo. Univ. Studies, Biol. Ser. 3:15-19. ♀, ♂.

Biology: Wheeler and Wheeler, 1973. Ants of Deep Canyon, p. 81.



- rhea** Wheeler. S. Ariz.; Mexico. Ecology: Prefers to nest on plateaus or in foothills at the base of mountains, 3700 to 7000 ft.  
*Pheidole rhea* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:452. ♀.
- Taxonomy: Smith, 1943. Ent. Soc. Wash., Proc. 45:5-9 (worker, soldier). —Gregg, 1949. Psyche 56:70-73.
- Biology: Gregg, 1949. Psyche 56:70-73.
- ridicula** Wheeler. Tex. (Brownsville area).  
*Pheidole ridicula* Wheeler, 1916. New England Zool. Club, Proc. 6:29. ♀.
- Biology: Creighton, 1966. Psyche 73:1.
- rugulosa** Gregg. Tex., Ariz.  
*Pheidole rugulosa* Gregg, 1958. N. Y. Ent. Soc., Jour. 66:26-29. ♂, ♀, ♀, ♂.
- sciara** Cole. Tex., N. Mex.  
*Pheidole sciara* Cole, 1955. Tenn. Acad. Sci., Jour. 30:47-49. ♀, ♀.
- Taxonomy: Cole, 1956. Tenn. Acad. Sci., Jour. 31:116.
- sciophila** Wheeler. Tex. to s. Ariz.; Mexico.  
*Pheidole sciophila* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:443. ♀, ♀, ♀, ♂.  
*Pheidole proserpina* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:437. ♀, ♀.  
*Pheidole sciophila* var. *semilaevicephala* Smith, 1934. Ent. Soc. Amer., Ann. 27:385. ♀.
- Taxonomy: Creighton and Gregg, 1955. Colo. Univ. Studies, Biol. Ser. 3:19-22.
- Biology: Cole, 1934. Ent. Soc. Amer., Ann. 27:397.
- senex** Gregg. Tex., Colo., N. Mex.  
*Pheidole senex* Gregg, 1952. Amer. Mus. Novitates 1557:1-4. ♀, ♀.  
*Pheidole pilifera anfracta* Cole, 1952. Tenn. Acad. Sci., Jour. 27:278. ♀, ♀.
- Taxonomy: Gregg, 1955. Psyche 62:22-23.
- Biology: Gregg, 1963. Ants of Colo., pp. 422-424.
- sitarches campestris** Wheeler. Miss., Mo. w. to Colo., central Tex.  
*Pheidole sitarches rufescens* var. *campestris* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:443. ♀, ♀.
- Pheidole sitarches rufescens* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:443. ♀, ♀, ♀.
- Taxonomy: Gregg, 1958. N. Y. Ent. Soc., Jour. 66:37.
- Biology: Smith, 1924. Ent. News 35:53. —Gregg, 1963. Ants of Colo., pp. 424-425.
- sitarches littoralis** Cole. Fla. (Lido Beach, Sarasota).  
*Pheidole sitarches littoralis* Cole, 1952. Ent. Soc. Amer., Ann. 45:443-444. ♀, ♀.
- Taxonomy: Gregg, 1958. N. Y. Ent. Soc., Jour. 66:39.
- sitarches sitarches** Wheeler. Tex. (Brownsville area); Mexico.  
*Pheidole sitarches* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:440. ♀, ♀, ♀.  
*Pheidole sitarches* var. *transvarians* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:442. ♀, ♀.
- Taxonomy: Cole, 1952. Ent. Soc. Amer., Ann. 45:444. —Gregg, 1958. N. Y. Ent. Soc., Jour. 66:39.
- Biology: Wheeler, 1910. Ants, p. 279. —Wilson, 1957. Psyche 64:46-50 (nuptial flights).
- sitarches soritis** Wheeler. W. Tex., N. Mex., Utah, Ariz.; Mexico.  
*Pheidole soritis* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:439. ♀, ♀.  
*Pheidole tepicana cavigenis* Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34:403. ♀.
- Taxonomy: Cole, 1952. Ent. Soc. Amer., Ann. 45:444. —Gregg, 1958. N. Y. Ent. Soc., Jour. 66:37.
- spadonia** Wheeler. S. Ariz.; Mexico.  
*Pheidole spadonia* Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34:400. ♀, ♀.
- Taxonomy: Creighton and Gregg, 1955. Colo. Univ. Studies, Biol. Ser. 3:22-24 (also biological notes).

**subdentata** Pergande. Ariz.; Mexico.*Pheidole subdentata* Pergande, 1895. Calif. Acad. Sci., Proc. 5:888. ♀.*Pheidole obtusospinosa* Pergande, 1895. Calif. Acad. Sci., Proc. 5:889. ♀.*Pheidole arizonica* Santschi, 1909. Soc. Ent. Ital., Bol. 41:3. ♀.

Taxonomy: Creighton, 1957. N. Y. Ent. Soc., Jour. 65:211.

**tepicana** Pergande. Tex., Ariz.; Mexico. A polymorphic species with the largest soldiers and smallest workers connected by intermediates, unlike the dimorphic worker castes of most *Pheidole*.*Pheidole tepicana* Pergande, 1895. Calif. Acad. Sci., Proc. 5:878. ♀, ♀.*Pheidole rugifrons* Pergande, 1895. Calif. Acad. Sci., Proc. 5:880. ♀.*Pheidole carbonaria* Pergande, 1895. Calif. Acad. Sci., Proc. 5:881. ♀, ♀.*Pheidole Kingi* Andre, 1898. Soc. Ent. de France, Bul. p. 244. ♀, ♀.*Pheidole Townsendi* Andre, 1898. Soc. Ent. de France, Bul., p. 246. ♀, ♀.*Pheidole kingi instabilis* Emery, 1901. Soc. Ent. de France, Bul., p. 129. ♀, ♀.*Pheidole kingi torpescens* Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34:404. ♀, ♀.

Taxonomy: Wheeler and Wheeler, 1953. Ent. Soc. Wash., Proc. 55:74 (larva). —Creighton and Gregg, 1955. Colo. Univ. Studies, Biol. Ser. 3:24-35.

Biology: Wheeler, 1901. Soc. Ent. de Belg., Ann. 45:203. —Wheeler, 1907. Amer. Mus. Nat. Hist., Bul. 23:2-12. —Cole, 1956. Tenn. Acad. Sci., Jour. 31:113.

Morphology: Wheeler, 1910. Ants, p. 56.

**texana** Wheeler. Tex. (Travis Co.).*Pheidole texana* Wheeler, 1903. Psyche 10:95. ♀, ♀.

Taxonomy: Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:464.

**titanis** Wheeler. W. Tex. to s. Ariz. Ecology: Diet may be restricted to termites.*Pheidole titanis* Wheeler, 1903. Psyche 10:95. ♀, ♀.

Taxonomy: Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:461-462. —Creighton and Gregg, 1955. Colo. Univ. Studies, Biol. Ser. 3:35-37 (also biological notes; termite feeding).

**tysoni** Forel. Va., N. C., Ohio, Tenn.*Pheidole tysoni* Forel, 1901. Soc. Ent. de Belg., Ann. 45:348. ♀, ♀, ♂.

Taxonomy: Cole, 1940. Amer. Midland Nat. 24:42, 45.

Biology: Dennis, 1938. Ent. Soc. Amer., Ann. 31:282, 304. —Wesson and Wesson, 1940. Amer. Midland Nat. 24:92.

**vallicola** Wheeler. S. Ariz.*Pheidole crassicornis vallicola* Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34:409. ♀, ♀.**virago** Wheeler. Tex., Ariz.*Pheidole virago* Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34:401. ♀, ♀.**vistana** Forel. S. Calif.; Mexico. Ecology: Found in deserts in small crater nests in the soil.*Pheidole susannae longipes* Pergande, 1895. Calif. Acad. Sci., Proc. 5:885. ♀, ♀. Preocc. by Latreille, 1802; Smith, 1858.*Pheidole longipes* var. *vistana* Forel, 1914. Soc. Vaud. des Sci. Nat., Bul. 50:272. ♀.*Pheidole grallipes* Wheeler, 1916. Psyche 23:40. N. name for *longipes* Pergande.

Taxonomy: Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34:397-398.

Biology: Mallis, 1941. South. Calif. Acad. Sci., Bul. 40:69. —Wheeler and Wheeler, 1973. Ants of Deep Canyon, pp. 77-79.

**xerophila tucsonica** Wheeler. Tex., N. Mex., Ariz., Calif.; Mexico. Ecology: Nests in soil may be craterlike or with small mounds.*Pheidole xerophila tucsonica* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:448. ♀, ♀.

Taxonomy: Creighton and Gregg, 1955. Colo. Univ. Studies, Biol. Ser. 3:40-42.

Biology: Cole, 1934. Ent. Soc. Amer., Ann. 27:397. —Wheeler and Wheeler, 1973. Ants of Deep Canyon, pp. 82-83.

**xerophila xerophila** Wheeler. Tex., N. Mex., s. Calif. Ecology: Found in small crater nests in the desert soil. The range of this subspecies lies slightly to the south of that of *tucsonica* in Tex. and N. Mex.

*Pheidole xerophila* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:446. ♀, ♂.

Taxonomy: Creighton and Gregg, 1955. Colo. Univ. Studies, Biol. Ser. 3:40-42.

Biology: Wheeler and Wheeler, 1973. Ants of Deep Canyon, p. 82.

**yaqui** Creighton and Gregg. S. Calif.; Mexico. Ecology: Found in deserts in small crater nests in the soil.

*Pheidole yaqui* Creighton and Gregg, 1955. Colo. Univ. Studies, Biol. Ser. 3:43-46. ♀, ♂.

Biology: Wheeler and Wheeler, 1973. Ants of Deep Canyon, pp. 83-84.

## TRIBE CARDIOCONDYLINI

### Genus CARDIOCONDYLA Emery

*Cardiocondyla* Emery, 1869. Accad. degli Aspiranti Naples, Ann. 2:20.

Type-species: *Cardiocondyla elegans* Emery. Monotypic.

*Emeryia* Forel, 1890. Soc. Ent. de Belg. Ann. (C. R.) 34:110.

Type-species: *Emeryia wroughtoni* Forel. Monotypic.

*Xenometa* Emery, 1917. Soc. Ent. de France, Bul., p. 96.

Type-species: *Xenometa monilicornis* Emery. Monotypic.

*Cardiocondyla* subg. *Dyclona* Santschi, 1930. Rev. Suisse de Zool. 37:70. Syn. questionable.

Type-species: *Monomorium cristatum* Santschi. Orig. desig.

*Cardiocondyla* subg. *Loncyda* Santschi, 1930. Rev. Suisse de Zool. 37:70. Syn. questionable.

Type-species: *Cardiocondyla (Loncyda) monardi* Santschi. Monotypic.

*Cardiocondyla* subg. *Prosopidris* Wheeler, 1935. Psyche 42:40.

Type-species: *Cardiocondyla (Prosopidris) sima* Wheeler. Orig. desig.

The majority of species of this genus are found in the warmer parts of Europe, Asia, and Africa. In the United States, members of this genus are found in the southern tier of states from Florida to California. The colonies are small and nests are constructed in soil and in plant cavities. They are easily transported by commerce and all the species below may have been introduced.

Revision: Smith, 1944. Ent. Soc. Wash., Proc. 46:30-41 (U. S. species).

Taxonomy: Weber, 1952. Amer. Mus. Novitates 1548:5. —Brown, 1973. *In* Meggers, *et al.*, Tropical forest ecosystems in Afr. and S. Amer., pp. 161-185 (generic syn.).

Biology: Wilson, 1960. Psyche 66:29-34 (tandem running).

**ectopia** Snelling. Ariz., s. Calif. Possibly of Old World origin.

*Cardiocondyla ectopia* Snelling, 1974. N. Y. Ent. Soc., Jour. 82: 76-81, figs. ♀, ♂.

Biology: Creighton and Snelling, 1974. N. Y. Ent. Soc., Jour. 82: 87-91 (behavior).

**emeryi** Forel. Fla., Tex.; W. Indies, Africa, Asia, Pacific Islands. Probably introduced. A tramp species distributed by commerce throughout the tropics.

*Cardiocondyla emeryi* Forel, 1881. Munchen Ent. Ver., Mitt. 5:5. ♀.

*Cardiocondyla nuda* subsp. *nereis* Wheeler, 1927. Amer. Acad. Arts and Sci., Proc. 62:140. ♀, ♂.

Taxonomy: Borgmeier, 1937. Rev. de Ent. 7:133 (ergatoid male). —Weber, 1952. Amer. Mus. Novitates 1548:5. —Wilson and Taylor, 1967. Pacific Ins. Monog. 14:53 (Polynesia).

Biology: Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21:89. —Smith, 1936. Puerto Rico Univ., Jour. Agr. 20:835. —Creighton and Snelling, 1974. N. Y. Ent. Soc., Jour. 82: 82-86 (behavior).

**nuda** (Mayr). Fla., Ga., La., Tex.; Pacific Islands. Probably introduced into U. S. from the Oriental Region.

*Leptothorax nudus* Mayr, 1866. Akad. der Wiss. Wien, Math.-Nat. Kl., Sitzber. 53:508. ♀.

*Cardiocondyla nuda* var. *minutior* Forel, 1899. Fauna Hawaiiensis, 1:120. ♀.

- Taxonomy: Wilson and Taylor, 1967. Pacific Ins. Monog. 15:55 (Polynesia). —Wheeler and Wheeler, 1973. Ga. Ent. Soc., Jour. 8:27 (larva).
- Biology: Phillips, 1934. (Hawaii Univ.) Expt. Sta., Pineapple Prod. Coop. Assoc. Bul. 15:22. —Creighton and Snelling, 1974. N. Y. Ent. Soc., Jour. 82: 86-87 (behavior).
- venustula** Wheeler, Fla., La.; Puerto Rico, Haiti. Probably introduced.
- Cardiocondyla venustula* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:128. ♀, ♀.
- Biology: Smith, 1936. Puerto Rico Univ., Jour. Agr. 20:836. —Smith, 1944. Fla. Ent. 27:15.
- wroughtonii** (Forel). Fla., Ga.; Oriental Region. Probably introduced.
- Emergia wroughtonii* Forel, 1890. Soc. Ent. de Belg., Ann. (C. R.) 34:110. "♀" = ergatomorphic ♂.
- Cardiocondyla wroughtonii* var. *hawaiiensis* (!) Forel, 1899. Fauna Hawaiensis 1:119. ♀.
- Cardiocondyla wroughtonii* var. *bimaculata* Wheeler, 1929. Lab. Zool. Gen. e Agr. Portici, Bol. 24:43. ♀, ♀.
- Taxonomy: Wilson and Taylor, 1967. Pacific Ins. Monog. 14:56 (Polynesia).
- Biology: Wheeler, 1932. N. Y. Ent. Soc., Jour. 40:7. —Smith, 1933. Fla. Ent. 17:24.

# TRIBE CREMATOGASTRINI

## Genus CREMATOGASTER Lund

- Crematogaster* Lund, 1831. Ann. des Sci. Nat., Zool. 23:132.
- Type-species: *Formica scutellaris* Olivier. Desig. by Bingham, 1903.
- Crematogaster* Agassiz, 1846. Nomencl. Zool., Index Univ., p. 103. Emend.
- Acrocoelia* Mayr, 1852. Zool.-Bot. Gesell. Wien, Verh. 2:147.
- Type-species: *Acrocoelia ruficeps* Mayr. Desig. by Wheeler, 1911.
- Crematogaster* subg. *Oxygyne* Forel, 1901. Soc. Ent. de Belg., Ann. 45:375.
- Type-species: *Crematogaster (Oxygyne) daisyi* Forel. Desig. by Wheeler, 1911.
- Decacrema* Forel, 1910. Soc. Ent. de Belg., Ann. 54:18.
- Type-species: *Crematogaster schencki* Forel. Desig. by Wheeler, 1911.
- Crematogaster* subg. *Atopogyne* Forel, 1911. Soc. Vaud. des Sci. Nat., Bul. 47:342.
- Type-species: *Crematogaster (Atopogyne) hellanica* Forel. Desig. by Wheeler, 1911.
- Physocrema* Forel, 1912. Soc. Ent. de Belg., Mem. 14:220.
- Type-species: *Crematogaster inflatus* Smith. Desig. by Wheeler, 1911.
- Xiphocrema* Forel, 1913. Zool. Jahrb., Abt. f. System. 36:80.
- Type-species: *Crematogaster tetracantha* Emery. Desig. by Emery, 1922.
- Eucrema* Santschi, 1918. Soc. Ent. de France, Bul., p. 182.
- Type-species: *Formica acuta* Fabricius. Orig. desig.
- Nematocrema* Santschi, 1918. Soc. Ent. de France, Bul. p. 182.
- Type-species: *Crematogaster stadelmanni* Mayr. Orig. desig.
- Neocrema* Santschi, 1918. Soc. Ent. de France, Bul., p. 182.
- Type-species: *Crematogaster distans* Mayr. Orig. desig.
- Orthocrema* Santschi, 1918. Soc. Ent. de France, Bul. p. 182.
- Type-species: *Myrmica sordidula* Nylander. Orig. desig.
- Paracrema* Santschi, 1918. Soc. Ent. de France, Bul. p. 182.
- Type-species: *Crematogaster spengeli* Forel. Orig. desig.
- Sphaerocrema* Santschi, 1918. Soc. Ent. de France, Bul. p. 182.
- Type-species: *Crematogaster kneri* Mayr. Orig. desig.
- Crematogaster* subg. *Rhachiocrema* Mann, 1919. Harvard Univ., Mus. Comp. Zool., Bul. 63:318.
- Type-species: *Crematogaster (Rhachiocrema) wheeleri* Mann. Orig. desig.
- Tranopeltoides* Wheeler, 1922. Amer. Mus. Novitates 48:10.
- Type-species: *Tranopelta huberi* Forel. Orig. desig.
- Crematogaster* subg. *Colobocrema* Wheeler, 1927. Quart. Rev. Biol. 2:31.
- Type-species: *Crematogaster (Colobocrema) cylindriceps* Wheeler. Monotypic.
- Mesocrema* Santschi, 1923. Soc. Ent. de Belg., Bul. 68:33.
- Type-species: *Crematogaster rasoherini* Forel. Desig. by Donisthorpe, 1943.
- Apterocrema* Wheeler, 1936. Psyche 43:45.

Type-species: *Apterocrema atillani* Wheeler. Monotypic.

These ants nest in moderately large colonies under objects in the soil, in wood, in cavities of plants, in insect galls, in carton nests of their own making, or even in the woodwork of buildings. Most are omnivorous but show a preference for sweets and some tend honeydew excreting insects. Some are well known house-infesting forms; others have been reported to kill young birds or gnaw rubber insulation from telephone wires. North American species of this genus had been separated into two subgenera, subgenus *Orthocrema* for *arizonensis* and *minutissima* and its subspecies and subgenus *Crematogaster* for the remaining species. Subgenera are not recognized here.

Revision: Mayr, 1870. Zool.-Bot. Gesell. Wien, Verh. 20:989-996. —Emery, 1895. Zool. Jahrb., Abt. f. System. 8:280-288. —Wheeler, 1919. Psyche 26:111. —Creighton, 1939. Psyche 46:137-140 (subg. *Orthocrema*). —Buren, 1968. Ga. Ent. Soc., Jour. 3:91-121 (subg. *Crematogaster*).

Taxonomy: Wheeler and Wheeler, 1952. Wash. Acad. Sci., Jour. 42:258-261 (larvae). —Buren, 1958. N. Y. Ent. Soc., Jour. 66:119-134 (also biological notes). —Brown, 1973. In Meggers, et al., Tropical Forest Ecosystems in Afr. and S. Amer., pp. 161-185 (generic syn.). —Wheeler and Wheeler, 1973. Ga. Ent. Soc., Jour. 8:27-30 (larvae).

Biology: Soulie, 1962. Insectes Sociaux 9:181-195 (colony foundation and development).

*arizonensis* Wheeler. S. Ariz. Ecology: Apparently arboreal; found nesting in mistletoe on oaks.

*Crematogaster arizonensis* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:482. ♀.

Biology: Wheeler, 1912. N. Y. Ent. Soc., Jour. 20:130-133 (also description of female, male).

*ashmeadi* Mayr. Va. to Fla., w. to Tex. Ecology: Strictly arboreal; nests in twigs and branches.

*Crematogaster Ashmeadi* Mayr, 1886. Zool.-Bot. Gesell. Wien, Verh. 36:463. ♀, ♂.

*Crematogaster (Acrocoelia) ashmeadi* var. *matura* Wheeler, 1932. N. Y. Ent. Soc., Jour. 40:8. ♀.

Taxonomy: Wheeler, 1932. N. Y. Ent. Soc., Jour. 40:8.

Biology: Smith, 1924. Ent. News 35:79. —Cole, 1940. Amer. Midland Nat. 24:46. —Smith, 1965. U. S. Dept. Agr., Tech. Bul. 1326:28-29 (economic importance). —Leuthold, 1968. Psyche 75:233-248 (tibial gland scent-trail and trail-laying behavior). —Leuthold, 1968. Psyche 75:334-350 (recruitment to food).

*atkinsoni* Wheeler. N. C. s. to Fla., w. to Miss. Ecology: Common in coastal salt-grass marshes where they often build large carton nests on sedges or bushes. Nests are sometimes a foot and a half or more above the ground and range in size from the diameter of an egg to that of a human head.

*Crematogaster atkinsoni* Wheeler, 1919. Psyche 26:108. ♀.

*Crematogaster atkinsoni* var. *helveola* Wheeler, 1919. Psyche 26:109. ♀ (♀, ♂ misdet.).

The female and male are *C. ashmeadi*.

Biology: Atkinson, 1887. Amer. Nat. 21:770-771. —Smith, 1930. Fla. Ent. 14:4-5. —Wheeler, 1932. N. Y. Ent. Soc., Jour. 40:8-9.

*browni* Buren. W. Tex., N. Mex., s. Ariz. Ecology: In mountains, usually over 5000 ft.; nests have been found under rocks.

*Crematogaster browni* Buren, 1968. Ga. Ent. Soc., Jour. 3:100. ♀, ♀.

*californica* Emery. S. Calif.; Mexico. Ecology: Nests in soil in desert or semidesert habitats; found at bases and on roots of various plants cultivating aphids and coccids. Males are unusually large for this genus.

*Crematogaster lineolata laeviuscula* var. *californica* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:285. ♀.

Taxonomy: Wheeler, 1934. Pan-Pacific Ent. 10:135-136.

Biology: Mallis, 1941. South. Calif. Acad. Sci., Bul. 40:70. —Wheeler and Wheeler, 1973. Ants of Deep Canyon, pp. 87-88.

- cerasi* (Fitch). Que. s. to Ga., w. to S. Dak., Ark., N. Mex. Ecology: Nests under rocks and logs; sometimes does minor damage when nesting in woodwork and timbers in houses.  
*Myrmica cerasi* Fitch, 1855 (1854). N. Y. State Agr. Soc., Trans. 14:835. ♀.  
*Crematogaster (Acrocoelia) kennedyi* Wheeler, 1930. Psyche 37:58. ♀, ♂.  
*Crematogaster (Acrocoelia) lineolata cerasi* var. *punctinodis* Enzmann, 1946. N. Y. Ent. Soc., Jour. 54:91, 93, 96. ♀, ♀, ♂.
- Taxonomy: Emery, 1895. Zool. Jahrb., Abt. f. System. 8:282-283. —Wheeler, 1933. Psyche 40:83-84. —Wheeler and Wheeler, 1952. Wash. Acad. Sci., Jour. 42:250-252 (larva, as *lineolata*). —Wheeler and Wheeler, 1973. Ga. Ent. Soc., Jour. 8:28 (larva).
- Biology: Gaige, 1914. Mich. Univ., Mus. Zool., Occas. Papers 5:8-9. —Headley, 1943. Ohio Jour. Sci. 43:25. —Morris, 1943. Ind. Acad. Sci., Proc. 52:208. —Wheeler and Wheeler, 1944. N. Dak. Hist. Quart. 11:245. —Kannowski, 1959. Insectes Sociaux 6:125. —Kulman, 1965. Jour. Econ. Ent. 58:865 (in cocoons of *Thyridopteryx ephemeriformis*). —Smith, 1965. U. S. Dept. Agr., Tech. Bul. 1326:30-31 (economic importance).
- clara* Mayr. N. J. s. to Fla., w. to Ind., Mo., Tex. Ecology: Nests in a variety of semi-arboreal situations in or near swamps, salt marshes, rivers, and streams.  
*Oecodoma (Atta) bicolor* Buckley, 1867. Ent. Soc. Phila., Proc. 6:350. ♀. Preocc. by Smith, 1860.  
*Crematogaster clara* Mayr, 1870. Zool.-Bot. Gesell. Wien, Verh. 20:990, 993. ♀.
- Taxonomy: Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:481 (each caste). —Smith, 1924. Ent. News 35:80. —Wheeler and Wheeler, 1952. Wash. Acad. Sci., Jour. 42:255-256 (larva, as *laeviuscula*).
- Biology: Dennis, 1938. Ent. Soc. Amer., Ann. 31:283. —Smith, 1965. U. S. Dept. Agr., Tech. Bul. 1326:31-32 (economic importance).
- Morphology: Pasteels, Crews, and Blum, 1970. Acad. Soc. Paris, Compt. Rend., Ser. D 271:835-838 (histology of gland secreting the trail pheromone).
- coarctata* Mayr. Oreg.(?), Nev., Calif. Ecology: Nests under rocks and boulders. Suspected of now being a rather rare species in coastal Calif. due to displacement by the Argentine ant.  
*Crematogaster coarctata* Mayr, 1870. Zool.-Bot. Gesell. Wien, Verh. 20:990, 992. ♀.
- Taxonomy: Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:482. —Creighton, 1950. Harvard Univ., Mus. Comp. Zool., Bul. 104:207-208.
- Biology: Mallis, 1941. South. Calif. Acad. Sci., Bul. 40:70-71. —Essig, 1926. Ins. of West. N. Amer., p. 859.
- colei* Buren. W. Tex., N. Mex., Ariz. Ecology: Nests under rocks in grassland situations at elevations over 5000 ft.  
*Crematogaster colei* Buren, 1968. Ga. Ent. Soc., Jour. 3:108. ♀, ♀.
- dentinodis* Forel. Ariz.; Mexico. Ecology: Nests under stones in open grasslands and chaparral, or grass and mesquite, or among shrubs in succulent desert areas.  
*Crematogaster opaca* var. *dentinodis* Forel, 1901. Soc. Ent. de Belg., Ann. 45:130. ♀
- depilis* Wheeler. Tex., N. Mex., Ariz., Nev., s. Calif.; Mexico. Ecology: Nests in and among roots and lower stems of various plants throughout desert and semi-desert regions.  
*Crematogaster lineolata opaca* var. *depilis* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:478. ♀.
- Taxonomy: Creighton, 1950. Harvard Univ., Mus. Comp. Zool., Bul. 104:209 (worker, not female). —Wheeler and Wheeler, 1973. Ga. Ent. Soc., Jour. 8:28-30 (larva).
- Biology: Cole, 1966. Brigham Young Univ., Sci. Bul., Biol. Ser. 7:16. —Wheeler and Wheeler, 1973. Ants of Deep Canyon, p. 88.
- emeryana* Creighton. W. Tex., Colo., N. Mex., Utah, Ariz.; Mexico. Ecology: Usually in mountains at elevations of over 6000 ft.; often constructs carton structures under rocks.  
*Crematogaster lineolata lineolata* var. *emeryana*, 1895. Zool. Jahrb., Abt. f. System. 8:282. ♀, ♀, ♂. Variety described but not named.

- Crematogaster (Acrocoelia) lineolata emeryana* Creighton, 1950. Harvard Univ., Mus. Comp. Zool., Bul. 104:213-214. ♀.
- Biology: Gregg, 1963. Ants of Colo., pp. 358-360.
- hespera* Buren. W. Tex., N. Mex., Utah, Ariz., Calif.; Mexico. Ecology: Usually arboreal in cottonwood trees along rivers and streams; also in other trees and rotten logs.
- Crematogaster hespera* Buren, 1968. Ga. Ent. Soc., Jour. 3:98. ♀, ♀.
- isolata* Buren. W. Tex., N. Mex., s. Ariz. Ecology: Arboreal in oaks in mountain ranges at altitudes over 5000 ft.
- Crematogaster isolata* Buren, 1968. Ga. Ent. Soc., Jour. 3:106. ♀.
- laeviuscula* Mayr. La., Tex., Okla.; Mexico. Ecology: Incipient colonies are often found in twigs and oak galls, larger colonies in hollow trees and logs. No authentic records east of Mississippi River.
- Oecodoma (Atta) arborea* Buckley, 1867. Ent. Soc. Phila., Proc. 6:349-350. ♀, ♀. Preocc. by Smith, 1858.
- Crematogaster laeviuscula* Mayr, 1870. Zool.-Bot. Gesell. Wien, Verh. 20:990, 993. ♀.
- Taxonomy: Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:481 (each caste). —Cole, 1940. Amer. Midland Nat. 24:46.
- larreae* Buren. W. Tex., Ariz., Calif.; Mexico. Ecology: Nests in lower stems and among roots of the creosote bush. Host: *Larrea divaricata*.
- Crematogaster larreae* Buren, 1968. Ga. Ent. Soc., Jour. 3:117. ♀, ♀, ♂.
- lineolata* (Say). Que., Ont. s. to Fla., w. to N. Dak., Colo., Tex. Ecology: Nests in ground under objects or in logs or stumps; infests houses and often nests within buildings.
- Myrmica lineolata* Say, 1836. Boston Jour. Nat. Hist. 1:290. ♀, ♀, ♂.
- Myrmica (Monomarium (!) marylandica* Buckley, 1867. Ent. Soc. Phila., Proc. 6:339. ♀. Syn. uncertain.
- Myrmica (Monomarium (!) columbiana* Buckley, 1867. Ent. Soc. Phila., Proc. 6:340. ♀, ♀. Syn. uncertain.
- Crematogaster lineolata lineolata* var. *lutescens* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:282. ♀.
- Crematogaster (Acrocoelia) lineolata cerasi* var. *wheldeni* Enzmann, 1946. N. Y. Ent. Soc., Jour. 54:92-93, 96. ♀.
- Taxonomy: Smith, 1918. Ent. News 29:19. —Buren, 1944. Iowa State Col., Jour. Sci. 18:288. —Wheeler and Wheeler, 1952. Wash. Acad. Sci., Jour. 42:252 (larva as *lineolata subopaca*).
- Biology: Wheeler, 1906. Amer. Mus. Nat. Hist., Bul. 22:1-18. —Wheeler, 1917. Conn. State Geol. and Nat. Hist. Survey Bul. 22:585. —Wesson and Wesson, 1940. Amer. Midland Nat. 24:93. —Wallace, 1945. Conn. State Ent., 44th Rpt., Bul. 488:389 (economics). —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 132-133. —Gregg, 1963. Ants of Colo., pp. 357, 359. —Ayre, 1963. Canad. Ent. 95:712-715 (feeding habits). —Smith, 1965. U. S. Dept. Agr., Tech. Bul. 1326:32-33 (economic importance). —Ayre, 1968. Canad. Ent. 100:165-172 (prey finding, capture, transport). —Ayre, 1969. Canad. Ent. 101:118-128 (trail formation and group foraging).
- marioni* Buren. S. Calif.; Mexico. Ecology: Arboreal species in manzanita and live oaks.
- Crematogaster marioni* Buren, 1968. Ga. Ent. Soc., Jour. 3:105. ♀.
- minutissima minutissima* Mayr. N. C. s. to Fla., w. to Tex. Ecology: Nests have been found in soil at bases of stumps.
- Crematogaster minutissima* Mayr, 1870. Zool.-Bot. Gesell. Wien, Verh. 20:991, 995. ♀, ♀.
- Taxonomy: Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:484. —Wheeler and Wheeler, 1960. Ent. Soc. Wash., Proc. 62:14 (larva).
- Biology: Smith, 1928. Ent. News 39:277.
- Morphology: Pasteels, Crewe, and Blum, 1970. Paris Acad. Soc., Compt. Rend., Ser. D 271:835-838 (histology of gland secreting the trail pheromone).

*minutissima missouriensis* Emery. Nebr., Mo., Tex., Colo., N. Mex.

*Crematogaster victima missouriensis* (!) Emery, 1895. Zool. Jahrb., Abt. f. System. 8:287. ♀.

Taxonomy: Wheeler and Wheeler, 1952. Wash. Acad. Sci., Jour. 42:260-261 (larva).

Biology: Gregg, 1963. Ants of Colo., pp. 363-364.

*minutissima smithi* Creighton. Ariz. (Huachuca Mtns.).

*Crematogaster (Orthocrema) minutissima thoracica* Creighton, 1939. Psyche 46:138. ♀. Preocc. by Santschi, 1921.

*Crematogaster (Orthocrema) minutissima smithi* Creighton, 1950. Harvard Univ., Mus. Comp. Zool., Bul. 104:205. N. name.

*mormonum* Emery. Utah, Idaho, e. Oreg. (?), Nev., Calif.; Mexico. Ecology: Most common in the Great Basin; nests under rocks.

*Crematogaster lineolata coarctata* var. *mormonum* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:284. ♀.

Taxonomy: Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:482 (each caste).

Biology: Cole, 1942. Amer. Midland Nat. 28:363. —Wheeler and Wheeler, 1973. Ants of Deep Canyon, pp. 88-89.

*mutans* Buren. Nev., Calif. Ecology: The only North American species of this genus suspected of being parasitic.

*Crematogaster mutans* Buren, 1968. Ga. Ent. Soc., Jour. 3:115. ♀, ♀.

*navajoa* Buren. N. Mex., Ariz. in the Colorado Plateau region. Ecology: Found under rocks and at bases of various plants.

*Crematogaster navajoa* Buren, 1968. Ga. Ent. Soc., Jour. 3:102. ♀, ♀.

*nocturna* Buren. S. Utah, n. Ariz.

*Crematogaster nocturna* Buren, 1968. Ga. Ent. Soc., Jour. 3:112. ♀, ♂, possible ♀.

*opaca* Mayr. Ariz. (Tumacacori Mts., under stones among oaks, 3900 ft.); Mexico. Only a single Arizona record for the U. S.

*Crematogaster opaca* Mayr, 1870. Zool.-Bot. Gesell. Wien, Verh. 20:989. ♀.

*opuntiae* Buren. N. Mex., s. Ariz. Ecology: Found principally at bases of and foraging on *Opuntia fulgida* but also at bases of various other plants.

*Crematogaster opuntiae* Buren, 1968. Ga. Ent. Soc., Jour. 3:120. ♀.

*pilosa* Emery. N. J. s. to Ga. Ecology: Often nests in logs and fallen branches in marshy situations.

*Crematogaster lineolata pilosa* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:285. ♀.

*Crematogaster lineolata subpilosa* Wheeler, 1913. Psyche 20:115. Syn. uncertain. Nomen nudum.

*Crematogaster (Acrocoelia) creightoni* Wheeler, 1933. Psyche 40:86. ♀.

Taxonomy: Wheeler, 1933. Psyche 40:85.

Biology: Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21:379. —Wheeler, 1906. Amer. Mus. Nat. Hist., Bul. 22:6-7.

*punctulata* Emery. Va. s. to Fla., w. to Colo., Ariz.; Mexico. Ecology: Abundant in southern Great Plains region where they nest in the ground and tend aphids and coccids.

*Crematogaster punctulata* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:287. ♀.

*Crematogaster lineolata lineolata* var. *subopaca* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:283. ♀, ♀, ♂.

*Crematogaster (Acrocoelia) opaca* var. *texana* Santschi, 1929. Wien Ent. Ztg. 46:91. ♀.

Taxonomy: Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:479-480.

Biology: Smith, 1927. Ent. News 38:310. —Gregg, 1963. Ants of Colo., pp. 361-362, 364.

*rifelna* Buren. S. Tex.; Mexico. Ecology: Arboreal, found nesting in live oaks and other trees. *Crematogaster rifelna* Buren, 1968. Ga. Ent. Soc., Jour. 3:96. ♀, ♀, ♂.



*vermiculata* Emery. N. C. s. to Fla., w. to Ark., La. Ecology: Arboreal, found only in cypress swamps.

*Crematogaster vermiculata* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:286. ♀. Types mislabeled, not found in Calif. or other western states.

Taxonomy: Wheeler and Wheeler, 1960. Ent. Soc. Wash., Proc. 62:13 (larva).

### TRIBE SOLENOPSIDINI

#### Genus MONOMORIUM Mayr

*Monomorium* Mayr, 1855. Zool.-Bot. Gesell. Wien, Verh. 5:452.

Type-species: *Monomorium minutum* Mayr. Monotypic.

*Phacota* Roger, 1862. Berlin. Ent. Ztschr. 6:260. Uncertain syn.

Type-species: *Phacota sicheli* Roger. Monotypic.

*Trichomyrmex* Mayr, 1865. Novara Exped., Zool., Formicidae, pt. 2, v. 1, p. 19.

Type-species: *Trichomyrmex rogeri* Mayr. Monotypic.

*Lampromyrmex* Mayr, 1868. Beitr. Naturk. Preuss. 1:92.

Type-species: *Lampromyrmex gracillimus* Mayr. Monotypic.

*Holcomyrmex* Mayr, 1878. Zool.-Bot. Gesell. Wien, Verh. 28:671.

Type-species: *Holcomyrmex scabriceps* Mayr. Desig. by Bingham, 1903.

*Epoecus* Emery, 1892. Soc. Ent. de France, Bul. 61: CCLXXVI.

Type-species: *Epoecus pergandei* Emery. Monotypic.

*Wheeleria* Forel, 1905. Soc. Ent. de Belg., Ann. 49:171. Preocc. by Tutt, 1895.

Type-species: *Wheeleria santschii* Forel. Monotypic.

*Wheeleriella* Forel, 1907. Inst. Sci. Revue 4:145. N. name for *Wheeleria* Forel.

*Epixenus* Emery, 1908. Deut. Ent. Ztschr., p. 556.

Type-species: *Epixenus andrei* Emery. Desig. by Wheeler, 1911.

*Monomorium* subg. *Xeromyrmex* Emery, 1915. Ent. Soc. de France, Bul. p. 190.

Type-species: *Formica salomonis* Linnaeus. Orig. desig.

*Monomorium* subg. *Parholcomyrmex* Emery, 1915. Ent. Soc. de France, Bul. p. 190.

Type-species: *Myrmica gracillima* Smith. Orig. desig.

*Monomorium* subg. *Paraholcomyrmex* Emery, 1915. Soc. Ent. de France, Bul. p. 191.

Misspelling ?.

*Mitara* Emery, 1913. Soc. Ent. de Belg., Ann. 57:261.

Type-species: *Monomorium laeve* Mayr. Orig. desig.

*Monomorium* subg. *Corynomyrmex* Viehmeyer, 1916. Arch. f. Naturgesch. 18:134.

Type-species: *Monomorium (Corynomyrmex) hospitum* Viehmeyer. Monotypic.

*Monomorium* subg. *Isolcomyrmex* Santschi, 1917. Soc. Cient. Argentina, An. 84:296.

Type-species: *Holcomyrmex santschii* Forel. Orig. desig.

*Paraphacota* Santschi, 1919. Soc. Ent. de France, Bul., p. 91.

Type-species: *Phacota noualhieri* Emery. Orig. desig.

*Monomorium* subg. *Equestrimessor* Santschi, 1919. Soc. Ent. de France, Bul. p. 92.

Type-species: *Holcomyrmex chobauti* Emery. Desig. by Donisthorpe, 1943.

*Xenhyboma* Santschi, 1919. Soc. Espan. de Hist. Nat., Bol. 19:405. Uncertain syn.

Type-species: *Xenhyboma mystes* Santschi. Monotypic.

*Equestrimessor* Santschi, 1936. Bul. Soc. Sci. Nat. Maroc. 16:32. Emend.

*Isholcomyrmex* Santschi, 1936. Bul. Soc. Sci. Nat. Maroc. 16:32. Variant spelling.

*Ireneidris* Donisthorpe, 1943. Ent. Monthly Mag. 79:81.

Type-species: *Ireneidris myops* Donisthorpe. Monotypic.

*Monomorium* subg. *Pharaophanes* Bernard, 1952. Inst. Franc. d'Afr. Noire, Mem. 19:238.

Nomen nudum.

*Xenoaphaenogaster* Baroni Urbani, 1964. Atti della Accad. Gioenia di Sci. Nat. Catania 16:50. Uncertain syn.

Type-species: *Xenoaphaenogaster inquilina* Baroni Urbani. Orig. desig.

Members of this genus are small in size and are particularly adaptable with respect to nesting sites. They may nest in various preformed cavities or in soil. Most species are Old World, but because of their adaptability and size, they are especially susceptible to distribution by com-

merce. Three of the North American species have been introduced and are common tramp species and house pests.

- Taxonomy: Wheeler and Wheeler, 1955. Amer. Midland Nat. 54:121-122 (larvae).  
 —Ettershank, 1966. Austral. Jour. Zool. 14:82-93 (generic syn., list of world species).  
 —Brown, 1973. In Meggers, *et al.*, Tropical Forest Ecosystems in Afr. and S. Amer., pp. 161-185 (generic syn.). —Wheeler and Wheeler, 1973. Ga. Ent. Soc., Jour. 8:30-31 (larvae).

Morphology: Blum, 1966. Roy. Ent. Soc. London, Proc. (A) 41: 155-160 (source and specificity of trail pheromones).

**destructor** (Jerdon). Tenn., Fla.; throughout tropical regions of world. Ecology: A pantropical tramp and common house-infesting ant that may nest in soil or in buildings. They are omnivorous and may feed on various household foods. They have been reported to gnaw holes in fabrics, rubber goods, remove rubber insulation from electric or telephone wires, and damage polyethylene cable. Introduced, probably originating from Africa or the Oriental region.

- Atta Destructor* Jerdon, 1851. Madras Jour. Lit. and Sci. 17:105. ♀.  
*Myrmica vastator* Smith, 1857. Linn. Soc. London, Jour., Zool. 2:71.  
*Myrmica basalis* Smith, 1858. Cat. Hym. Brit. Mus. 6:125. ♀.

Taxonomy: Bingham, 1903. Fauna British India 2:209 (each caste). —Emery, 1908. Deut. Ent. Ztschr. pp. 665-666, 671. —Phillips, 1934. (Hawaii Univ.) Expt. Sta. Pineapple Prod. Coop. Assoc., Bul. 15:2. —Wilson and Taylor, 1967. Pacific Ins. Monog. 14:64.

Biology: Wheeler, 1910. Ants, pp. 10, 153, 221. —Wheeler, 1914. Amer. Jour. Trop. Dis. and Prev. Med. 2:160-168 (economics). —Smith, 1936. Puerto Rico Univ., Jour. Agr. 20:833. —Kalshoven, 1937. Ent. Meded. van Nederland. Indie 3:65-71. —Marlatt, 1928. U. S. Dept. Agr., Farmers' Bul. 740:9. —Kempf, 1960. Studia Ent. 3:506-507 (economics). —Smith, 1965. U. S. Dept. Agr., Tech. Bul. 1326:37-38 (economic importance).

**floricola** (Jerdon). Fla., Ala.; throughout tropical regions of world. Ecology: An arboreal species, nesting in twigs and branches or under bark of trees or other plants. Commonly infests houses and feeds on household foods. Introduced, probably originating from tropical Asia.

- Atta floricola* Jerdon, 1851. Madras Jour. Lit. and Sci. 17:107. ♀.  
*Monomorium speculare* Mayr, 1866. Akad. der Wiss. Wien, Math.-Nat. Kl., Sitzber. 53:509.

Taxonomy: Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21:88 (female). —Smith, 1936. Puerto Rico Univ., Jour. Agr. 20:831, 834. —Wheeler and Wheeler, 1955. Amer. Midland Nat. 54:121 (larva). —Wilson and Taylor, 1967. Pacific Ins. Monog. 14:64-65.

Biology: Wheeler, 1910. Ants, pp. 153, 426. —Smith, 1930. Fla. Ent. 14:3. —Wheeler, 1932. N. Y. Ent. Soc., Jour. 40:9. —Plank and Smith, 1940. Puerto Rico Univ., Jour. Agr. 24:49-75 (association with pineapple mealybug, *Pseudococcus brevipes* (Ckll.)). —Brown, 1964. Ent. News 75:15. —Smith, 1965. U. S. Dept. Agr., Tech. Bul. 1326:36-37 (economic importance).

**minimum** (Buckley). Que., Ont. s. to Fla., w. to Mont., Colo., Calif.; Mexico. Rare or absent in the Pacific Northwest. Ecology: Nests in exposed soil, under cover of objects, or in rotting or faulty wood. Sometimes invades houses from outdoors or nests in woodwork. Parasite: *Monomorium pergandei* (Emery). Little black ant.

- Myrmica (Monomarium (!)) minima* Buckley, 1867. Ent. Soc. Phila., Proc. 6:338. ♀, ♀.  
*Myrmica (Monomarium (!)) atra* Buckley, 1867. Ent. Soc. Phila., Proc. 6:342. ♂ (?).  
*Monomorium minutum ergatogyna* Wheeler, 1904. Amer. Mus. Nat. Hist., Bul. 20:269. ♀, apterous ergatoid ♀.

*Monomorium minimum emersoni* Gregg, 1945. Psyche 52:66. ♀, ♀.  
*Monomorium metoecus* Brown and Wilson, 1957. Ent. News 68: 239-244. Ergatogyne.

Taxonomy: Emery, 1895. Zool. Jahrb., Abt. f. System. 8:274-275 (each caste). —Wheeler, 1905. South. Calif. Acad. Sci., Bul. 40:60. —Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:423. —Buren, 1944. Iowa State Col. Jour. Sci. 18:289. —Wheeler and Wheeler, 1955. Amer. Midland Nat. 54:122 (larva). —Wilson and Brown, 1958. Ent. News 69:33-38 (worker of *metoecus*; also biology). —Ettershank, 1966. Austral. Jour. Zool. 14:90 (syn. of *metoecus*).

**Biology:** Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21:274, 377. —Marlatt, 1922. U. S. Dept. Agr., Farmers' Bul. 740:4, 10. —Eckert and Mallis, 1937. Calif. Agr. Expt. Sta., Cir. 342:23. —Dennis, 1938. Ent. Soc. Amer., Ann. 31:271, 272, 274, 279-280. —Metcalf and Flint, 1939. Destructive and Useful Insects, p. 770. —Gregg, 1944. Ent. Soc. Amer., Ann. 37:454, 456, 466. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 133-135. —Gregg, 1963. Ants of Colo., pp. 366-368. —Burns, 1964. Ent. Soc. Amer., Ann. 57:138 (association with tuliptree scale). —Smith, 1965. U. S. Dept. Agr., Tech. Bul. 1326:33-34 (economic importance). —Wheeler and Wheeler, 1973. Ants of Deep Canyon, pp. 89-90.

**pergandei** (Emery). D. C. Ecology: Supposedly workerless and parasitic. The host colony contained only winged males and winged females. Host: *Monomorium minimum* (Buckley).

*Epoecus pergandei* Emery, 1892. Soc. Ent. de France, Bul. 61: CCLXXVI. ♀, ♂.

**Taxonomy:** Emery, 1895. Zool. Jahrb., Abt. f. System. 8:272-274. —Wheeler, 1910. Ants, p. 498. —Smith, 1947. Amer. Midland Nat. 37:569 (female). —Ettershank, 1966. Austral. Jour. Zool. 14:82, 91.

**pharaonis** (Linnaeus). Fla., throughout U. S. and Canada in larger cities; cosmopolitan.

**Ecology:** Not uniformly distributed; adapted to field conditions only in Florida but probably found in every town or city of commercial importance especially in hotels, large apartment buildings, groceries, or other places where food is commercially handled. Colonies are populous and are commonly found in the most inaccessible places in buildings. They breed continuously through the year and take 38 to 42 days to develop. They may feed on various household foods, damage silk, rayon and rubber goods and are also known to damage insect collections. This is the most persistent and difficult of all our house-infesting ants to control or eradicate. Introduced, probably originating from Africa or tropical Asia. Pharaoh ant.

*Formica Pharaonis* Linnaeus, 1758. Syst. Nat., Ed. 10:580.

**Taxonomy:** Emery, 1908. Deut. Ent. Ztschr., pp. 664-665, 667, 684 (each caste).

—Donisthorpe, 1927. British Ants, p. 104. —Buren, 1944. Iowa State Col., Jour. Sci. 18:289. —Wheeler and Wheeler, 1955. Amer. Midland Nat. 54:121 (larva). —Wheeler and Wheeler, 1960. Ent. Soc. Wash., Proc. 62: 16 (larva). —Wilson and Taylor, 1967. Pacific Ins. Monog. 14:68-60.

**Biology:** Bellevoye, 1889. U. S. Dept. Agr., Insect Life 2:230-233 (in 2 years, 1,360,000 workers, 1,900 females, and 560 males taken on same premises). —Herrick, 1914. Insects Injurious to the Household and Annoying to Man, pp. 174-176. —Essig, 1926. Insects of West. N. Amer., p. 857. —Metcalf and Flint, 1939. Destructive and Useful Insects, p. 770. —Smith, 1934. Kans. Acad. Sci., Trans. 37:140-142. —Armand, 1942. Pests 10:18-19 (thermal preference as guide to control work). —Peacock and Baxter, 1949. Ent. Monthly Mag. 85:256. —Peacock, 1950. Ent. Monthly Mag. 86:129. —Peacock and Baxter, 1950. Ent. Monthly Mag. 86:171-178 (life history). —Peacock, 1950. Ent. Monthly Mag. 86:294. —Peacock, *et al.*, 1950. Scot. Dept. Agr., Misc. Pub. 17:1-50 (biology and control). —Peacock, 1951. Ent. Monthly Mag. 87:185-191. —Sudd, 1953. Advancement of Sci. (Brit.) 10:17-18 (colony foundation). —Peacock, *et al.*, 1954. Ent. Monthly Mag. 90:154-158 (male production by parthenogenesis). —Peacock, *et al.*, 1955. Ent. Monthly Mag. 91:125, 130. —Peacock, *et al.*, 1955. Ent. Monthly Mag. 91:37-42 (viability in regard to temperature and moisture). —Brown, 1958. Acta Hym. 1:36. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 135-136. —Brown, 1964. Ent. News 75:14-15. —Eichler, 1963. Deut. Ent. Ztschr. 10:207-215. —Smith, 1965. U. S. Dept. Agr., Tech. Bul. 1326:34-36 (economic importance). —Wisniewski, Myjak, and Przyborowski, 1971. Polskie Pismo Ent. 61:459-474 (biology, in Poland). —Petersen and Buschinger, 1971. Anz. f. Schadlingsk. u. Pflanzensch. 44:121-127 (behavior). —Petersen and Buschinger, 1971. Ztschr. f. Angew. Ent. 68:168-175 (behavior of sexuals).

**Morphology:** Tanquary, 1913. Ill. State Lab. Nat. Hist., Bul. 9:443-453 (physiology). —Hall and Smith, 1951. Ent. Monthly Mag. 87:217. —Hall and Smith, 1952. Ent. Monthly Mag. 88:97-102 (thoracic structure). —Hall and Smith, 1953. Evolution 7:127. —Hall and Smith, 1954. Ent. Monthly Mag. 90:176-182 (somatic mosaics). —Smith and Peacock, 1957. Roy. Soc. Edinb., Proc., Section B, 66:235-261 (cytology).

**viridum peninsulatum** Gregg, Ga., Fla. w. to Colo., Ariz., s. Calif. Ecology: Most commonly found in soil under objects.

*Monomorium peninsulatum* Gregg, 1945. *Psyche* 52:62. ♀, ♀.

Biology: Gregg, 1963. *Ants of Colo.*, pp. 368-370.

**viridum viridum** Brown, N. Y. (Coram, Selden, L. I.), N. J. (Lakehurst). Ecology: The types from N. J. were taken from nests with 5 to 8 inch craters in yellow and white sand among scanty, low weeds of a roadside strip.

*Monomorium viridum* Brown, 1943. *Ent. News* 54:243. ♀, ♀.

#### Genus XENOMYRMEX Forel

*Xenomyrmex* Forel, 1885. *Soc. Vaud. des Sci. Nat.*, Bul. 20:369.

Type-species: *Xenomyrmex stollii* Forel. Monotypic.

*Myrmecineilla* Wheeler, 1922. *Amer. Mus. Novitates* 46:1.

Type-species: *Myrmecineilla panamana* Wheeler. Monotypic.

A small New World genus of three species. The ants are arboreal, nesting in small colonies in plant cavities such as twigs, galls, and thorns.

Revision: Wheeler, 1931. *Rev. de Ent.* 1:129-139. —Creighton, 1957. *Amer. Mus. Novitates* 1843:1-14.

Taxonomy: Creighton, 1953. *Amer. Mus. Novitates* 1634:2. —Wheeler and Wheeler, 1960.

*Ent. Soc. Wash.*, Proc. 62:19-20 (larva). —Ettershank, 1966. *Austral. Jour. Zool.* 14:150-152.

**floridanus floridanus** Emery. Fla.; Bahamas, Cuba. Another subspecies is found in Mexico.

*Xenomyrmex stollii floridanus* Emery, 1895. *Zool. Jahrb.*, Abt. f. System. 8:275. ♀, ♂.

*Xenomyrmex stollii floridanus* var. *lucayanus* Wheeler, 1905. *Amer. Mus. Nat. Hist.*, Bul. 21:87. ♀.

*Xenomyrmex stollii rufescens* Wheeler, 1931. *Rev. de Ent.* 1:133, 137. ♀.

*Xenomyrmex stollii cubanus* Wheeler, 1931. *Rev. de Ent.* 1:134-135. ♀.

Biology: Wheeler, 1901. *Amer. Nat.* 35:538. —Wheeler, 1932. *N. Y. Ent. Soc.*, Jour. 40:6.

Morphology: Holldobler, 1971. *Jour. Ins. Physiol.* 17:1497-1499 (sex pheromone).

#### Genus SOLENOPSIS Westwood

*Solenopsis* Westwood, 1841. *Ann. and Mag. Nat. Hist.* 6:86.

Type-species: *Solenopsis mandibularis* Westwood. Monotypic.

*Diplorhoptrum* Mayr, 1855. *Zool.-Bot. Gesell. Wien*, Verh. 5:449.

Type-species: *Formica fugax* Latreille. Monotypic.

*Solenopsis* subg. *Synsolenopsis* Forel, 1918. *Soc. Vaud. des Sci. Nat.*, Bul. 52:155.

Type-species: *Solenopsis bruchiella* Emery. Monotypic.

*Solenopsis* subg. *Diagyne* Santschi, 1923. *Rev. Suisse de Zool.* 30:267.

Type-species: *Solenopsis succinea* Emery. Monotypic.

*Labauchena* Santschi, 1930. *Soc. Ent. Argent.*, Rev. 13:81.

Type-species: *Labauchena daguerrei* Santschi. Monotypic.

*Solenopsis* subg. *Euophthalma* Creighton, 1930. *Amer. Acad. Arts and Sci.*, Proc. 66: 43.

Type-species: *Myrmica globularia* Smith. Orig. desig.

*Solenopsis* subg. *Oedaleocerus* Creighton, 1930. *Amer. Acad. Arts and Sci.*, Proc. 66:43.

Type-species: *Solenopsis argulata* Emery. Orig. desig.

*Bisolenopsis* Kusnezov, 1953. *Acta. Zool. Lilloana* [Tucuman] 13:1.

Type-species: *Bisolenopsis sea* Kusnezov. Monotypic.

*Paranamyrmica* Kusnezov, 1954. *Mus. Entre Rios*, Mem. 30:9.

Type-species: *Paranamyrmica solenopsidis* Kusnezov. Monotypic.

*Lilidris* Kusnezov, 1957. *Zool. Anz.* 158:268, 274. Uncertain syn.

Type-species: *Lilidris metatarsalis* Kusnezov. Monotypic.

*Solenopsis* subg. *Granisolenopsis* Kusnezov, 1957. *Zool. Anz.* 158:270, 277.

Type-species: *Solenopsis (Granisolenopsis) granivora* Kusnezov. Monotypic.

Previously, this genus was divided into several subgenera, the subgenus *Solenopsis* included the larger, polymorphic species *aurea*, *geminata*, *invicta*, *richteri*, and *xyloni*, the subgenus *Euophthalma* included *globularia littoralis* and *huachucana*, and the subgenus *Diplorhoptrum* included the minute "thief ants", the remaining species listed here. Those previously placed in the subgenus *Solenopsis* are commonly known as "fire ants", the colonies are populous, nests are usually mounded in exposed situations, and workers are aggressive and possess a painful sting. They are of the most economically important of ants. Most species in the other subgenera are minute and cryptic, often lestopibiotic in the nests of other ants.

Revision: Emery, 1895. Zool. Jahrb., Abt. f. System. 8:277-279 (*Diplorhoptrum*). —Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34:397. —Creighton, 1930. Amer. Acad. Arts and Sci., Proc. 66:39-139.

Taxonomy: Wheeler and Wheeler, 1955. Amer. Midland Nat. 54:131-136 (larvae). —Snelling, 1963. Calif. Dept. Agr., Bur. Ent., Occas. Papers No. 3, 10 pp. (keys to all castes of subg. *Solenopsis*). —Ettershank, 1966. Austral. Jour. Zool. 14:134-144 (generic syn. and list of world species). —Buren, 1972. Ga. Ent. Soc., Jour. 7:1-27 (revisionary studies of the imported fire ants).

Morphology: Blum, *et al.*, 1958. Science 128:306-307 (chemical, insecticidal and antibiotic properties of fire ant venom). —MacConnel, Blum and Fales, 1971. Tetrahedron 26:1129-1139 (chemistry of fire ant venom). —San Martin, 1971. In Buchell and Buckley, Venomous Animals and Their Venoms v. 3, pp. 95-101 (venomous ants of *Solenopsis*).

*aurea* Wheeler. Tex., N. Mex., Ariz., s. Calif.; Mexico. Ecology: Nests are in fully exposed situations, in dry, coarse, gravelly soil, and are without a mound.

*Solenopsis geminata* var. *aurea* Wheeler, 1906. Amer. Mus. Nat. Hist., Bul. 22:336. ♀, ♀, ♂.

*Solenopsis aurea amblychila* Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34:394. ♀, ♀, ♂.

Taxonomy: Snelling, 1963. Calif. Dept. Agr., Bur. Ent., Occas. Papers No. 3: 7.

Biology: Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:425-426.

*carolinensis* Forel. Mass. s. to N. C., Tenn., Ohio. Ecology: Probably lestopibiotic.

*Solenopsis tenana* race *carolinensis* Forel, 1901. Soc. Ent. de Belg., Ann. 45:345. ♀, ♀, ♂.

Biology: Wesson and Wesson, 1940. Amer. Midland Nat. 24:92.

*geminata* (Fabricius). S. C. s. to Fla., w. to Tex. and s. to Peru; West Indies; tropical Asia and Pacific Islands. Ecology: In the U. S., it is most common on or near the coast with its incidence decreasing inland except in Florida where it is distributed over most of the state. Nests are in the ground in open areas in dry to moist soil of various composition surmounted by irregular piles of dirt; they may also be under cover of objects or in rotting logs. Economic importance is similar to that of *xyloni* McCook, but its importance has subsided since the introduction of the imported fire ants. A common tramp species, native to the New World and spread by commerce to other tropical regions of the world. Fire ant.

*Atta geminata* Fabricius, 1804. Systema Piezatorum, p. 423. ♀.

*Atta Rufa* Jerdon, 1851. Madras Jour. Lit. and Sci. 17:106. ♀.

*Solenopsis mandibularis* Westwood, 1841. Ann. and Mag. Nat. Hist. 6:87. ♀.

*Myrmica virulens* Smith, 1858. Cat. Hym. Brit. Mus. 6:132. ♀.

*Atta clypeata* Smith, 1858. Cat. Hym. Brit. Mus. 6:169. ♀, ♂.

*Solenopsis cephalotes* Smith, 1858. Linn. Soc. London, Jour., Zool. 3:149. ♀.

*Crematogaster laboriosus* Smith, 1860. Linn. Soc. London, Jour., Zool. 4:109. ♀.

*Diplorhoptrum drewseni* Mayr, 1861. Eur. Formicid., p. 71. ♀.

*Myrmica glaber* Smith, 1862. Ent. Soc. London, Trans. (3) 1: 34. ♀.

*Myrmica polita* Smith, 1862. Ent. Soc. London, Trans. (3) 1: 34. ♀.

*Myrmica* (*Monomarium* (?) *sazicola* Buckley, 1867. Ent. Soc. Phila., Proc. 6:341. ♀. Syn. uncertain.

*Atta Lincecumii* Buckley, 1867. Ent. Soc. Phila., Proc. 6:344. ♀, ♀. Syn. uncertain.

*Atta coloradensis* Buckley, 1867. Ent. Soc. Phila., Proc. 6:345. ♀, ♀. Syn. uncertain.

*Atta bravoensis* Buckley, 1867. Ent. Soc. Phila., Proc. 6:346. ♀, ♀. Syn. uncertain.

*Solenopsis geminata* var. *diabola* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:424. ♀, ♂, ♂.

Taxonomy: Wheeler and Wheeler, 1955. Amer. Midland Nat. 54:132-133 (larva). —Snelling, 1963. Calif. Dept. Agr., Bur. Ent., Occas. Papers No. 3:7-9. —Wilson and Taylor, 1967. Pacific Ins. Monog. 14:58-59.

Biology: Mann, 1920. Amer. Mus. Nat. Hist., Bul. 42:427. —Marlatt, 1928. U. S. Dept. Agr., Farmers' Bul. 740:5. —Neig, 1930. Bombay Nat. Hist. Soc., Jour. 34:185. —Clark, 1931. Tex. Agr. Expt. Sta. Bul. 435:1-12. —Cole, 1934. Ent. Soc. Amer., Ann. 27:395. —Phillips, 1934. (Hawaii Univ.) Expt. Sta. Pineapple Prod. Coop. Assoc., Bul. 15:12-17. —Smith, 1936. Puerto Rico Univ., Jour. Agr. 20:838-839. —Plank and Smith, 1940. Puerto Rico Univ., Jour. Agr. 24:49-76. —Travis, 1941. Fla. Ent. 24:15-22. —Griffiths, 1942. Science 96:271-272. —Lindquist, 1942. Jour. Econ. Ent. 35:850-851. —Kempf, 1961. Studia Ent. 4:507. —Smith, 1965. U. S. Dept. Agr., Tech. Bul. 1326:40-41 (economic importance). —Banks, Plumley, and Hicks, 1973. Ent. Soc. Amer., Ann. 66:234-235 (polygyny in a colony). —Bass and Hays, 1976. Ga. Ent. Soc., Jour. 11: 34-36 (in S. C.).

*globularia littoralis* Creighton. N. C. s. to Fla., w. to La.; Mexico. Ecology: Commonly found on open beaches; nests are constructed in or under rotten logs. *S. globularia globularia* (Smith) occurs in Central and S. Amer.

*Solenopsis (Euophthalma) globularia littoralis* Creighton, 1930. Amer. Acad. Arts and Sci., Proc. 66:110, 113. ♀, ♂, ♂.

*Solenopsis globularia mobilensis* Smith, 1931. Ent. News 42:20. ♀. Nomen nudum.

Taxonomy: Wheeler and Wheeler, 1960. Ent. Soc. Wash., Proc. 62:22 (larva).

Biology: Smith, 1931. Ent. News 42:20. —Smith, 1933. Fla. Ent. 17:23.

*huachucana* Wheeler. Ariz. (Miller Canyon, Huachuca Mtns.).

*Solenopsis huachucana* Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34:393. ♀, ♀.

Taxonomy: Creighton, 1930. Amer. Acad. Arts and Sci., Proc. 66:118-120.

*invicta* Buren. N. C., S. C., Ga., Fla., Tenn., Ala., Miss., Ark., La., Tex.; Brazil. Ecology: The most widespread of the two imported fire ants and the most economically important being an annoying and sometimes destructive pest. The mound nests are unsightly and sometimes interfere with agricultural operations; workers are aggressive and can inflict a painful sting; workers steal seeds from seedbeds and feed on germinating seeds of corn, may gnaw holes in various fabrics, foster honeydew excreting insects, injure or kill young rabbits, pigs, and other mammals, quail and other birds, gnaw into roots, stems, buds, and fruits of various agricultural crops, and may girdle young plants. Introduced, probably originating from Mato Grosso, Brazil; the earliest U. S. record is 1945 from Daphne, Ala. Red imported fire ant. Because of the recent distinction of two introduced species in the U. S., it is difficult to determine whether much of the literature pertains to this species or *S. richteri*. Only selected references are given below; for a bibliography through 1971 see U. S. Dept. Agr., Coop. Econ. Ins. Rpt., 1971, Sept., 21 (36): 639-652. Much of the literature is under the name *S. saevissima richteri* Forel. *Solenopsis invica* (!) Buren, 1972. Ga. Ent. Soc., Jour. 7:9-15. ♀, ♀, ♂.

Taxonomy: Wilson, 1951. Evolution 5:68-79. —Wilson, 1952. Inst. Oswaldo Cruz, Mem. 50:49-68. —Wilson, 1953. Evolution 7:262-263. —Brown, 1957. Quart. Rev. Biol. 32:258-261. —Wilson and Brown, 1958. Evolution 12:211-218 (morphological changes in introduced population). —Snelling, 1963. Calif. Dept. Agr., Bur. Ent., Occas. Papers No. 3:10. —Buren, 1972. Ga. Ent. Soc., Jour. 7:9-15. —Buren, et al., 1974. N. Y. Ent. Soc., Jour. 82: 113-124 (zoogeography of the imported fire ants).

Biology: Wilson, 1958. Sci. Amer. 198:36-41. —Bellinger, Dyer, King and Pratt, 1965. Ga. Acad. Sci., Bul. 23:122 (review of fire ant problem). —Fincher and Lund, 1967. Ga. Ent. Soc., Jour. 2:91-94 (biology and life cycle in Ga.). —Rhoades and Davis, 1967. Jour. Econ. Ent. 60:544-558 (effects of meteorological factors on biology and control). —Anon. 1971 Sept., U. S. Dept. Agr., Coop. Econ. Ins. Rpt., 21 (36): 639-652 (bibliography through 1971). —Collins and Markin, 1971. Ent. Soc. Amer., Ann. 64:1376-1380 (inquilines and other arthropods). —Markin and Dillier, 1971. Ent. Soc. Amer., Ann. 64:562-565 (seasonal life

cycle in Miss.). —Smith, 1965. U. S. Dept. Agr., Tech. Bul. 1326:41-43 (economic importance). —Wilson and Oliver, 1969. Jour. Econ. Ent. 62:1268-1271 (food habits). —Glancey, *et al.*, 1970. Nature 226:863-864 (pheromone may induce brood tending). —Wilson, Dillier, and Markin, 1971. Ent. Soc. Amer., Ann. 64:660-665 (foraging territories). —Markin, *et al.*, 1971. Ga. Ent. Soc., Jour. 6:145-156 (nuptial flight and flight ranges). —Collins and Markin, 1971. Ent. Soc. Amer., Ann. 64:1376-1380 (inquilines and other arthropods in nests). —Markin, Collins, and Dillier, 1972. Ent. Soc. Amer., Ann. 65:1053-1058 (colony founding by queens). —Harris and Burns, 1972. Environ. Ent. 1:362-365 (predation on lone star tick). —Bhatkar, *et al.*, 1972. Environ. Ent. 1:274-279 (confrontation behavior between *Lasius neoniger* and the imported fire ant). —Stringer, *et al.*, 1972. Jour. Econ. Ent. 65:872-873 (air separation of different castes). —Glancey, Stringer, and Bishop, 1973. Ga. Ent. Soc., Jour. 8:217-220 (trophic egg production). —Glancey, *et al.*, 1973. Ga. Ent. Soc., Jour. 8:237-238 (multiple fertile queens in colonies). —O'Neal and Markin, 1973. Ga. Ent. Soc., Jour. 8:294-303 (brood nutrition and parental relationships). —Hubbard, 1974. Ga. Ent. Soc., Jour. 9: 127-132 (influence of nest material and colony odor on digging). —Allen, *et al.*, 1974. Ent. Soc. Amer., Ann. 67: 43-46 (distribution and habits in Brazil). —Morrill, 1974. Environ. Ent. 3: 265-271 (production and flight). —Morrill, 1975. Ga. Ent. Soc., Jour. 10: 162-164 (reduction of populations by tillage). —Horton, *et al.*, 1975. Ga. Ent. Soc., Jour. 10: 207-213 (food carrying ability and recruitment time). —Lofgren, Banks, and Glancey, 1975. Ann. Rev. Ent. 20: 1-30 (biology and control of imported fire ants). —Bass and Hays, 1976. Ga. Ent. Soc., Jour. 11: 34-36 (in S. C.). —Adams, *et al.*, 1976. Ga. Ent. Soc., Jour. 11: 165-169 (economic importance, impact on soybean harvest).

**Morphology:** Blum, *et al.*, 1958. Science 128:306-307 (chemical, insecticidal, and antibiotic properties of venom). —Callahan, Blum, and Walker, 1959. Ent. Soc. Amer., Ann. 52:573-590 (histology of poison glands and sting). —Adrouny, Derbes, and Jung, 1959. Science 130:479 (hemolytic component of fire ant venom). —Wilson, Durlach and Roth, 1959. Psyche 65:108-114 (chemical releases of necrophoric behavior). —Wilson, 1959. Science 129:643-644 (nature of odor trail). —Wilson, 1962. Animal Behavior 19:134-147 (chemical communication among workers-mass foraging). —Blum and Callahan, 1960. XI Int. Kong. Ent. Wien, Verh. B. 111:290-293 (chemical and biological properties of venom). —Wilson, 1962. Animal Behavior 10:148-158 (chemical communication among workers). —Wilson, 1962. Animal Behavior 10:159-164 (induction of social responses). —Walker and Clower, 1961. Ent. Soc. Amer., Ann. 54:92-99 (alimentary canal of queen). —Caro, Derbes, and Jung, 1957. Amer. Med. Assoc., Arch. Dermat. 75:475-488 (skin responses to sting). —Thompson and Blum, 1967. Ent. Soc. Amer., Ann. 60:632-642 (spermatzoa). —Vinson, 1970. Ent. Soc. Amer., Ann. 63:930-935 (gustatory response to various electrolytes). —MacConnell, Blum, and Fales, 1970. Science 168:840-841 (alkaloid from fire ant venom). —Smith and Smith, 1971. Arch. Dermat. 103:438-441 (multiple fire ant stings - a complication of alcoholism). —MacConnell, Blum, and Fales, 1971. Tetrahedron 26:1129-1139 (chemistry of fire ant venom). —Glancey, *et al.*, 1976. Ga. Ent. Soc., Jour. 11: 83-88 (testes degeneration). —Robeau and Vinson, 1976. Ga. Ent. Soc., Jour. 11: 198-203 (effects of juvenile hormone analogues on caste differentiation).

**kroekowi** Wheeler. N. Mex.; Mexico.

*Solenopsis kroekowi* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:428. ♂, ♀.

**molesta** (Say). Ont. s. to Fla., w. to Wash., Calif. Ecology: Lestobiotic, usually nests in or near nests of other ants from which they rob food and brood. A house-infesting ant and of great annoyance because of their small size; sometimes nests in woodwork and masonry of houses. Thief ant. The form occurring west of the Rockies is sometimes referred to as the subspecies *validiuscula*.

*Myrmica molesta* Say, 1836. Boston Jour. Nat. Hist. 1:293. ♀.

*Myrmica minuta* Say, 1836. Boston Jour. Nat. Hist. 1:294. ♀.

*Myrmica* (*Tetramorium* (?) *exigua* Buckley, 1867. Ent. Soc. Phila., Proc. 6:342. ♂, "♀" = ♂.

*Solenopsis debilis* Mayr, 1886. Zool.-Bot. Gesell. Wien, Verh. 36:461. ♂, ♀, ♂.

*Solenopsis molesta* var. *validiuscula* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:278. ♀.

- Taxonomy: Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:430. —Wheeler, 1917. Conn. State Geol. and Nat. Hist. Survey Bul. 22:584 (each caste). —Wheeler and Wheeler, 1955. Amer. Midland Nat. 54:134-135 (larva).
- Biology: Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21:377-378. —McColloch and Hayes, 1916. Jour. Econ. Ent. 9:23-38. —Hayes, 1920. Kans. Agr. Expt. Sta., Tech. Bul. 7:1-54. —Eckert and Mallis, 1937. Calif. Agr. Expt. Sta. Cir. 342:21-22. —Metcalf and Flint, 1939. Destructive and Useful Insects, p. 770. —Mallis, 1941. South. Calif. Acad. Sci., Bul. 40:72. —Macnamara, 1945. Canad. Ent. 77:40. —Grundmann and Peterson, 1953. Kans. Ent. Soc., Jour. 26:59. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 136-138. —Gregg, 1963. Ants of Colo., pp. 372-375. —Ayre, 1963. Canad. Ent. 95:712-715 (feeding habits). —Smith, 1965. U. S. Dept. Agr., Tech. Bul. 1326:43-45 (economic importance). —Wheeler and Wheeler, 1973. Ants of Deep Canyon, pp. 91-92.
- pergandeii** Forel. Va. s. to Fla., w. to La. Ecology: Nests have been found in soil in rotting stumps, and next to nests of other ants.
- Solenopsis pergandeii* Forel, 1901. Soc. Ent. de Belg., Ann. 45:343. ♀, ♂.
- Taxonomy: Smith, 1931. Ent. News 42:20. —Wheeler and Wheeler, 1960. Ent. Soc. Wash., Proc. 62:21-22 (larva).
- Biology: Smith, 1931. Ent. News 42:20. —Smith, 1944. Fla. Ent. 27:15.
- picta** Emery. S. C. s. to Fla., w. to Tex. Ecology: Nests have been found in hollow twigs.
- Solenopsis picta* Mayr, 1886. Zool.-Bot. Gesell. Wien, Verh. 36:262. ♀. Preocc. by Mayr, 1877.
- Solenopsis picta* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:278. ♀.
- Solenopsis picta* var. *moerens* Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34:393. ♀.
- Taxonomy: Smith, 1942. Ent. Soc. Wash., Proc. 44:211. —Wheeler and Wheeler, 1960. Ent. Soc. Wash., Proc. 62:22 (larva).
- Biology: Wheeler, 1932. N. Y. Ent. Soc., Jour. 40:10.
- pilosula** Wheeler. Tex. (Alice).
- Solenopsis pilosula* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:426. ♀, ♂.
- richteri** Forel. Miss., Ala.; S. Brazil, Uruguay, Argentina. Ecology: A mound building ant with similar habits and importance of *invicta* Buren. May have been more widespread in U. S. until the introduction of *invicta* which may have replaced *richteri* in many localities. Introduced, probably originating from southern S. Amer.; first recorded from Mobile, Ala. in 1930 but may have been present there for 10 to 12 years. Black imported fire ant. Until 1972, the imported fire ant had been known under one name, *S. saevissima richteri* Forel; consequently, it is difficult to determine to which species, either *invicta* or *richteri*, much of the earlier literature pertains. For a bibliography of the "imported fire ant" through 1971, see U. S. Dept. Agr., Coop. Econ. Ins. Rpt., 1971, Sept., 21 (36): 639-652, as well as the list of references given under *invicta*.
- Solenopsis Pylades* var. *Richteri* Forel, 1909. Deut. Ent. Ztschr., p. 267. ♀, ♂.
- Taxonomy: Creighton, 1930. Amer. Acad. Arts and Sci., Proc. 66:87 (first U. S. record). —Wilson, 1951. Evolution 5:68-79. —Wilson, 1952. Inst. Oswaldo Cruz, Mem. 50:49-68. —Wilson, 1953. Evolution 7:262-263 (origin of variation). —Brown, 1957. Quart. Rev. Biol. 32:258-261. —Wilson and Brown, 1958. Evolution 12:211-218 (morphological changes in introduced population). —Buren, 1972. Ga. Ent. Soc., Jour. 7:4-8 (two species of imported fire ants).
- Biology: Green, 1952. Jour. Econ. Ent. 45:593-597 (biology and control in Miss.). —Green, 1967. Miss. State Univ., Agr. Expt. Sta., Bul. 737, 23 pp.
- salina** Wheeler. W. Tex., Colo. w. to Calif.; Mexico. Ecology: Nests under rocks and wood; lestopiobic.
- Solenopsis salina* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:427. ♀.
- Biology: Gregg, 1963. Ants of Colo., pp. 376-378.
- tennesseensis** Smith. Fla., Tenn., Miss., Tex., Kans., Calif. (nr. Azusa).
- Solenopsis (Diplorhoptrum) longiceps* Smith, 1942. Ent. Soc. Wash., Proc. 44:210. ♀. Preocc. by Forel, 1907.



*Solenopsis (Diplorhoptrum) tennesseensis* Smith, 1951. In Muesebeck, *et al.*, U. S. Dept. Agr., Agr. Monog. 2:814. N. name.

*texana catalinae* Wheeler, Calif. (Catalina Is.).

*Solenopsis texana catalinae* Wheeler, 1904. Amer. Mus. Nat. Hist., Bul. 20:269. ♀, ♀.

Taxonomy: Wheeler, 1905. South. Calif. Acad. Sci., Bul. 4:60.

*texana texana* Emery. Ont. s. to Fla., w. to Okla., Tex. Ecology: Nests have been found in logs, stumps, and under bark.

*Solenopsis pollux* var. *texana* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:278. ♀.

*Solenopsis rosella* Kennedy, 1938. Canad. Ent. 70:232. ♀, ♀, ♂.

Taxonomy: Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:430-431. —Wheeler and Wheeler, 1955. Amer. Midland Nat. 54:136 (larva).

Biology: Mitchell and Pierce, 1912. Ent. Soc. Wash., Proc. 14:70.

*truncorum* Forel. N. C. s. to Fla., w. to Colo., Ariz., Calif. Ecology: Nests have been found under rocks and other objects; lestopibiotic.

*Solenopsis texana* race *truncorum* Forel, 1901. Soc. Ent. de Belg., Ann. 45:346. ♀, ♀.

*Solenopsis molesta* var. *castanea* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:430. ♀.

Biology: Gregg, 1963. Ants of Colo., pp. 378-380.

*xylini* McCook. N. C. s. to Fla., w. to Colo., Calif.; Mexico. Ecology: Nests are in ground in exposed soil or under cover of stones or other objects, sometimes in wood; they are surmounted by irregular and variable-shaped mounds of loose soil. A serious pest in some parts of its range: builds ugly mounds on lawns, inflicts painful stings, steals seeds from seedbeds, kills young poultry and other birds, girdles nursery stock, gnaws into buds, tubers, and fruits of various plants, bites holes in fabrics such as silk, nylon, and linen, removes rubber insulation from telephone wires, and feeds on household foods. Southern fire ant.

*Solenopsis xylini* McCook, 1879. In Comstock, Rpt. Cotton Ins., p. 188. ♀, ♀.

*Myrmica (Atta) sabeanus* Buckley, 1867. Ent. Soc. Phila., Proc. 6:343. ♀. Syn. questionable.

*Solenopsis geminata maniosa* Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34:396. ♀, ♀, ♂.

Taxonomy: Wheeler and Wheeler, 1955. Amer. Midland Nat. 54:133 (larva). —Snelling, 1963. Calif. Dept. Agr., Bur. Ent., Occas. Papers No. 3:9.

Biology: Severin, 1923. Jour. Econ. Ent. 16:96-97. —Smith, 1936. Jour. Econ. Ent. 29:120-122. —Eckert and Mallis, 1937. Calif. Agr. Expt. Sta. Cir. 342:10-21. —Mallis, 1938. Pan-Pacific Ent. 14:87-91. —Metcalf and Flint, 1939. Destructive and Useful Insects, p. 771.

—Eagleson, 1940. Jour. Econ. Ent. 33:700. —Wray, 1962. Jour. Econ. Ent. 55:145 (apparent introduction into N. C.). —Gregg, 1963. Ants of Colo., pp. 370-371, 373. —Smith, 1965. U. S. Dept. Agr., Tech. Bul. 1326:38-40 (economic importance). —Wheeler and Wheeler, 1973.

Ants of Deep Canyon, pp. 92-94.

Morphology: Blum, Roberts, and Novak, 1961. Psyche 68:73-74 (chemical and biological characters of venom).

### Genus OLIGOMYRMEX Mayr

*Oligomyrmex* Mayr, 1867. Ent. Tidskr. 10:110.

Type-species: *Oligomyrmex concinnus* Mayr. Monotypic.

*Aeromyrma* Forel, 1891. Soc. Ent. de Belg., Ann. 35:307.

Type-species: *Aeromyrma nosindambo* Forel. Monotypic.

*Pheidologeton* subg. *Analeus* Emery, 1900. Termes. Fuzetek 23:327.

Type-species: *Solenopsis similis* Mayr. Desig. by Wheeler, 1911.

*Erebomyrma* Wheeler, 1903. Biol. Bul. 4:138.

Type-species: *Erebomyrma longii* Wheeler. Monotypic.

*Pheidologeton* subg. *Lecanomyrma* Forel, 1913. Soc. Vaud. des Sci. Nat., Bul. 49:56.

Type-species: *Pheidologeton (Lecanomyrma) butteli* Forel. Monotypic.

*Oligomyrmex* subg. *Octella* Forel, 1915. Arkiv for Zool. 9:69.

Type-species: *Oligomyrmex (Octella) pachycerus* Forel. Monotypic.

*Spelaemyrmex* Wheeler, 1922. Amer. Mus. Novitates 45:9.

Type-species: *Spelaemyrmex urichi* Wheeler. Monotypic.

*Oligomyrmex* subg. *Hendecatella* Wheeler, 1927. Lab. Zool. Gen. e Agr. Portici, Bol. 20:93.

Type-species: *Oligomyrmex (Hendecatella) capreolus* Wheeler. Monotypic.

*Solenopsis* subg. *Solenops* Karawajew, 1930. Zool. Anz. 92:207. Preocc. by Dufour, 1820.

Type-species: *Solenopsis (Solenops) weyeri* Karawajew. Monotypic.

*Sporocleptes* Arnold, 1948. Natl. Mus. South. Rhodesia, Occas. Papers 2 (14): 219.

Type-species: *Sporocleptes nicotiana* Arnold. Monotypic.

*Solenopsis* subg. *Crateropsis* Patrizi, 1948. Ist. Ent. Univ. Bologna, Bol. 17:174.

Type-species: *Solenopsis (Crateropsis) elmenteitae* Patrizi. Monotypic.

*Nimbamyrmex* Bernard, 1953. Mem. Inst. Franc. Afr. Noire 19, fasc. 1, p. 240. Questionable syn.

Type-species: *Nimbamyrmex villiersi* Bernard. Monotypic.

A large genus in tropical Africa and Asia, with fewer species in the neotropics and only one species reaching the United States. Colonies are small and collections are usually made from under bark of logs, in rotten wood, or leaf litter. Most species may be lestopibiotic in the nests of other ants and termites.

Taxonomy: Wilson, 1962. Psyche 69:62-72. —Ettershank, 1966. Austral. Jour. Zool. 14:119-124 (generic syn. and list of world species). —Wheeler and Wheeler, 1953. Psyche 60:141 (larvae).

*longii* (Wheeler). Okla. (Ft. Sill), Tex. (Denton). Ecology: May be lestopibiotic.

*Erebomyrmex longii* Wheeler, 1903. Biol. Bul. 4:140. ♀, ♂.

Taxonomy: Mann, 1926. Psyche 33:104. —Wheeler, 1936. Amer. Acad. Arts and Sci., Proc. 71:197.

Biology: Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:423. —Wheeler, 1910. Ants, pp. 113, 140, 152, 158-159, 427-428.

#### TRIBE LEPTOTHORACINI

##### Genus *MACROMISCHA* Roger

*Macromischa* Roger, 1863. Berlin. Ent. Ztschr. 7:184.

Type-species: *Macromischa purpurata* Roger. Desig. by Wheeler, 1911.

*Macromischa* subg. *Croesomyrmex* Mann, 1920. Amer. Mus. Nat. Hist., Bul. 42:408.

Type-species: *Macromischa (Croesomyrmex) wheeleri* Mann. Orig. desig.

*Macromischa* subg. *Antillaemyrmex* Mann, 1920. Amer. Mus. Nat. Hist., Bul. 42:408.

Type-species: *Macromischa (Antillaemyrmex) terricola* Mann. Orig. desig.

A rather large genus in the neotropics with only three species reaching the United States.

Revision: Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:138-142. —Mann, 1920. Amer. Mus. Nat. Hist., Bul. 42:407-424. —Wheeler, 1931. Harvard Univ., Mus. Comp. Zool., Bul. 72:3-34. —Wheeler, 1937. Harvard Univ., Mus. Comp. Zool., Bul. 81:441, 449-458, 463-465. —Smith, 1939. Ent. Soc. Amer., Ann. 32:502-509.

Taxonomy: Brown, 1973. In Meggers, *et al.*, Tropical Forest Ecosystems in Afr. and S. Amer., p. 181 (listed as a provisional syn. of *Leptothorax*).

*floridana* (Wheeler). Fla. (Paradise Key, Dade Co.). Ecology: Nest of the types was found in a hollow branch of a small tree.

*Antillaemyrmex floridanus* Wheeler, 1931. Harvard Univ., Mus. Comp. Zool., Bul. 72:27. ♀.

Biology: Wheeler, 1932. N. Y. Ent. Soc., Jour. 40:11.

*polita* Smith. Ariz. Ecology: One nest was found under the bark of a tree, but most specimens have been taken on the ground.

*Macromischa polita* Smith, 1939. Ent. Soc. Amer., Ann. 32:503, 506. ♀.

*subditiva* Wheeler. La., Tex.; Mexico. Ecology: Nests have been found under willow bark, and from dead hollow branches lying on the ground.

*Macromischa subditiva* Wheeler, 1903. Psyche 10:99. ♀.

Biology: Mitchell and Pierce, 1912. Ent. Soc. Wash., Proc. 14:73. —Smith, 1939. Ent. Soc. Amer., Ann. 32:506. —Creighton, 1965. Psyche 72:282.

### Genus ROGERIA Emery

*Rogeria* Emery, 1894. Soc. Ent. Ital., Bol. 26:188.

Type-species: *Rogeria curvipubens* Emery. Desig. by Wheeler, 1911.

*Rogeria* subg. *Irogeria* Emery, 1915. Soc. Ent. de France, Bul. p. 191.

Type-species: *Rogeria procera* Emery. Orig. desig.

A neotropical genus with about 24 species. Only two species reach the southwestern U. S.

Taxonomy: Wheeler and Wheeler, 1955. Ent. Soc. Amer., Ann. 48:28 (larvae). —Kempf, 1961. Rev. Brasil. Biol. 21:435-441. —Kempf, 1962. Studia Ent. 5:1-38. —Kempf, 1963. Rev. Brasil. Biol. 23:189-196 (S. Amer. species). —Kempf, 1964. Studia Ent. 7:45-71. —Kempf, 1965. Rev. Brasil. Biol. 25:181-186. —Snelling, 1973. Los Angeles Co. Mus., Contrib. Sci. No. 236:1-6 (first record of genus in U. S.). —Wheeler and Wheeler, 1973. Psyche 80: 74 (larvae, revised description).

**creightoni** Snelling. Tex. (La Feria, Cameron Co.).

*Rogeria creightoni* Snelling, 1973. Los Angeles Co. Mus., Contrib. Sci. No. 236:2-4. ♀.

**huachucana** Snelling. Ariz. (Cochise Co.). Ecology: Specimens found beneath stones.

*Rogeria huachucana* Snelling, 1973. Los Angeles Co. Mus., Contrib. Sci. No. 236:4-6. ♀.

### Genus LEPTOTHORAX Mayr

Other than those genera listed under *Macromischa* and the subgenera of *Leptothorax*, Brown (1973) gives the following synonyms or possible synonyms: *Chalepoxenus* Menozzi, 1923?, *Doronomyrmex* Kutter, 1945?, *Epimyrmica* Emery, 1915?, *Formicoxenus* Mayr, 1855?, *Gonepimyrmica* Bernard, 1948?, *Icothorax* Hamann and Klemm, 1967?, *Leonomyrmica* Arnoldi, 1968?, *Myrmamnophilus* Menozzi, 1924, *Myrmetaerus* Soudék, 1925?, *Myrmoxenus* Ruzsksy, 1902?, *Symmyrmica* Wheeler, 1904?, and *Temnothorax* Mayr, 1861. There is apparently considerably more work to be done on this and related genera; consequently, I am using subgenera in *Leptothorax* as has been done in past catalogs.

Taxonomy: Brown, 1973. In Meggers, et al., Tropical Forest Ecosystems in Afr. and S. Amer., pp. 161-185.

### Genus LEPTOTHORAX Subgenus NESOMYRMEX Wheeler

*Leptothorax* subg. *Goniiothorax* Emery, 1896. Soc. Ent. Ital., Bol. 28:26, 58. Preocc. by Milne-Edwards, 1879.

Type-species: *Leptothorax vicinus* Mayr. Desig. by Wheeler, 1911.

*Nesomyrmex* Wheeler, 1910. Amer. Mus. Nat. Hist., Bul. 28:259.

Type-species: *Nesomyrmex clavipilis* Wheeler. Monotypic.

*Leptothorax* subg. *Caulomyrmica* Forel, 1914. Soc. Vaud. des Sci. Nat., Bul. 50:233.

Type-species: *Leptothorax echinatinodis* Forel. Orig. desig.

*Limnomyrmex* Arnold, 1948. Nat. Mus. So. Rhodesia, Occas. Papers 2 (14): 222.

Type-species: *Limnomyrmex stramineus* Arnold. Monotypic.

Most species of this subgenus are neotropical.

Revision: Kempf, 1959. Studia Ent. 2:391-432.

Taxonomy: Smith, 1950. Psyche 57:30. —Wheeler and Wheeler, 1955. Ent. Soc. Amer., Ann. 48:25 (larva). —Brown, 1971. Breviora 365:4-5 (generic syn.).

**wilda** Smith. S. Tex.; Mexico. Ecology: Arboreal, forms small colonies in plant cavities; probably nocturnal.

*Leptothorax (Goniiothorax) wilda* Smith, 1943. Ent. Soc. Wash., Proc. 45:155. ♀, ♂.

Biology: Creighton, 1971. Ga. Ent. Soc., Jour. 6:207-210 (distribution and habits).

### Genus LEPTOTHORAX Subgenus MYRAFANT Smith

*Leptothorax* subg. *Myrafant* Smith, 1950. Psyche 57:29.

Type-species: *Leptothorax curvispinosus* Mayr. Orig. desig.

These small ants nest in small colonies, commonly in preformed cavities under bark, hollow twigs, dried grass stems, old galls, or empty nut shells. A few may be found under rocks or in the soil. Some species are lestopibiotic, nesting near the nests of other ants, and others may be dulotic.

Revision: Emery, 1895. Zool. Jahrb., Abt. f. System. 8:317-318, 320-323. —Wheeler, 1903. Acad. Nat. Sci. Phila., Proc. 55:215, 224, 232-256.

Taxonomy: Smith, 1950. Psyche 57:29. —Smith, 1952. N. Y. Ent. Soc., Jour. 60:96-106 (*tricarinatus* - *texanus* complex). —Brown, 1955. Ent. News 66:43. —Wheeler and Wheeler, 1955. Ent. Soc. Amer., Ann. 48:22-25 (larvae). —Cole, 1956. Tenn. Acad. Sci., Jour. 31:30-31 (*tricarinatus* - *texanus* complex). —Cole, 1958. Ent. Soc. Amer., Ann. 51:535-538 (*nitens* - *carinatus* complex). —Wheeler and Wheeler, 1960. Ent. Soc. Wash., Proc. 62:23 (larvae).

**ambiguus ambiguus** Emery. Que. to Va., w. to N. Dak., S. Dak., Iowa, Nebr. Ecology: Nests in soil in woodlands and grasslands or in hollow dead grass stems near the soil.

*Leptothorax (Leptothorax) curvispinosus ambiguus* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:317, 320. ♀.

Taxonomy: Wheeler, 1917. Conn. State Geol. and Nat. Hist. Survey Bul. 22:588-589.

—Wesson and Wesson, 1940. Amer. Midland Nat. 24:97 (each caste). —Creighton, 1950. Harvard Univ., Mus. Comp. Zool., Bul. 104:261-262. —Wheeler and Wheeler, 1955. Ent. Soc. Amer., Ann. 48:22-23 (larva).

Biology: Sturtevant, 1925. Psyche 32:314. —Buren, 1944. Iowa State Col., Jour. Sci. 18:287. —Kannowski, 1959. Insectes Sociaux 6:124, 150-151, 155 (parasitism; pleometrosis). —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 140-141.

**ambiguus foveatus** Smith. Ill. (Plainfield). Ecology: Found in nest of a species of *Aphaenogaster* in a roadside ditch.

*Leptothorax foveata* Smith, 1934. Psyche 41:211. ♀.

**ambiguus pinetorum** Wesson and Wesson. Ohio (Jackson Co.).

*Leptothorax ambiguus* var. *pinetorum* Wesson and Wesson, 1940. Amer. Midland Nat. 24:97. ♀, ♀, ♂.

**andrei** Emery. N. Mex., Ariz., Nev., Calif. Ecology: Nests have been found under stones.

*Leptothorax (Leptothorax) andrei* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:318, 322. ♀.

Taxonomy: Cole, 1958. Ent. Soc. Amer., Ann. 51:537-538 (each caste).

Biology: Mallis, 1941. South. Calif. Acad. Sci., Bul. 40:73. —Wheeler and Wheeler, 1973. Ants of Deep Canyon, p. 95.

**bradleyi** Wheeler. Ga., Ala., Fla. Ecology: Colonies found in galleries in bark.

*Leptothorax bradleyi* Wheeler, 1913. Psyche 20:113. ♀.

Taxonomy: Wilson, 1952. Ent. News 63:68-71 (each caste).

**carinatus** Cole. W. Tex., Ariz. Ecology: Nests were found beneath stones.

*Leptothorax (Leptothorax) carinatus* Cole, 1957. Tenn. Acad. Sci., Jour. 32:213-215. ♀, ♀.

Taxonomy: Cole, 1958. Ent. Soc. Amer., Ann. 51:537-538. —Wheeler and Wheeler, 1973. Psyche 80: 70-71 (semipupa).

**curvispinosus** Mayr. Maine s. to Fla., w. to Iowa, Kans., Okla., Tex., Ariz. Ecology: Nests in plant cavities such as hollow stems, twigs, and in acorns. Enslaved by *Leptothorax duloticus* Wesson and *Harpagoxenus americanus* (Emery).

*Leptothorax curvispinosus* Mayr, 1866. Akad. der Wien, Math.-Nat. Kl., Sitzber. 53:508. ♀. *Stenamma gallarum* Patton, 1879. Amer. Nat. 13:126. ♀, ♀.

Taxonomy: Mayr, 1886. Zool.-Bot. Gesell. Wien, Verh. 36:451, 453 (worker, female). —Cole, 1940. Amer. Midland Nat. 24:56-57.

Biology: Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21:385. —Dennis, 1938. Ent. Soc. Amer., Ann. 31:289, 305. —Headley, 1943. Ent. Soc. Amer., Ann. 36:743-753 (population studies).

—Talbot, 1957. Ecology 38:449-456 (populations). —Kannowski, 1959. Insectes Sociaux 6:124. —Wilson and Fagan, 1974. N. Y. Ent. Soc., Jour. 82: 106-112 (estimation of total behavioral repertoires).

**furunculus** Wheeler. Wyo., Colo.

*Leptothorax furunculus* Wheeler, 1909. N. Y. Ent. Soc., Jour. 17:82. ♀.

Biology: Gregg, 1963. Ants of Colo., pp. 381-382.

**gallae** Smith. Calif. Ecology: Commonly found on the canyon live oak, *Quercus chrysolepis*, often in twig galls made by cynipids.

*Leptothorax (Leptothorax) gallae* Smith, 1949. Psyche 56:112. ♀.

**hispidus** Cole. W. Tex.; Mexico. Ecology: Nests were found under stones at higher elevations.

*Leptothorax (Leptothorax) hispidus* Cole, 1957. Tenn. Acad. Sci., Jour. 32:42-45. ♀, ♀.

Taxonomy: Wheeler and Wheeler, 1973. Psyche 80: 71 (immatures).

**longispinosus** Roger. Que., Ont. s. to Ga., Ala. w. to Iowa. Ecology: Nests in plant cavities such as hollow stems, twigs, and in acorns. Enslaved by *Leptothorax duloticus* Wesson and *Harpagozenus americanus* (Emery).

*Leptothorax longispinosus* Roger, 1863. Berlin. Ent. Ztschr. 7:180. ♀.

*Leptothorax (Leptothorax) longispinosus laeviceps* Buren, 1944. Iowa State Col., Jour. Sci. 18:286. ♀.

*Leptothorax longispinosus iowensis* Buren, 1945. Ent. Soc. Wash., Proc. 47:288. N. name for *laeviceps*, thought to be preocc. by *laeviceps* Emery, 1898.

Taxonomy: Wheeler, 1917. Conn. State Geol. and Nat. Hist. Survey Bul. 22:588. —Cole, 1940.

Amer. Midland Nat. 24:56-57. —Wheeler and Wheeler, 1955. Ent. Soc. Amer., Ann. 48:24 (larva).

Biology: Wheeler, 1910. Ants, pp. 212, 222, 495, 504. —Dennis, 1938. Ent. Soc. Amer., Ann.

31:274, 289, 305. —Headley, 1943. Ent. Soc. Amer., Ann. 36:743-753 (population studies).

—Kannowski, 1959. Insectes Sociaux 6:125. —Lettendre and Pilon, 1972. Nat. Canad.

99:73-82 (ecology; in Que.).

**mariposa** Wheeler. Calif. (Yosemite Natl. Pk.). Ecology: Colonies were found under stones.

*Leptothorax nitens* var. *mariposa* Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52:507. ♀.

Taxonomy: Cole, 1958. Ent. Soc. Amer., Ann. 51:536.

Biology: Mallis, 1941. South. Calif. Acad. Sci., Bul. 40:73-74.

**minutissimus** Smith. D. C. The type series of several females was associated with *L. curvispinosus* workers, but the exact relationship is not known.

*Leptothorax minutissimus* Smith, 1942. Ent. Soc. Wash., Proc. 44:59. ♀.

**nevadensis eldoradensis** Wheeler. Calif. (Coastal Range and lower elevations of the Sierras).

*Leptothorax eldoradensis* Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34:414. ♀.

Biology: Mallis, 1941. South. Calif. Acad. Sci., Bul. 40:73.

**nevadensis melanderi** Wheeler. W. Mont. to e. Wash.

*Leptothorax melanderi* Wheeler, 1909. N. Y. Ent. Soc., Jour. 17:81. ♀.

**nevadensis nevadensis** Wheeler. Wash., Oreg., Calif. (Eastern slopes of Sierras north to Cascade Mtns.). Ecology: Nests in soil, usually under stones.

*Leptothorax nevadensis* Wheeler, 1903. Acad. Nat. Sci. Phila., Proc. 55:224, 252. ♀, ♀, ♂.

Taxonomy: Wheeler, 1909. N. Y. Ent. Soc., Jour. 17:81. —Wheeler and Wheeler, 1973. Psyche 80: 71 (larva).

Biology: Wheeler and Wheeler, 1973. Ants of Deep Canyon, pp. 95-96 (subspecies not recognized).

**nevadensis rudis** Wheeler. Nev., Calif. (Sierras from Lake Tahoe to Sequoia Park).

*Leptothorax nevadensis rudis* Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52:508. ♀, ♀.

Biology: Mallis, 1941. South. Calif. Acad. Sci., Bul. 40:73. —Cole, 1966. Brigham Young Univ., Sci. Bul., Biol. Ser. 7:17.

**nitens** Emery. Wyo., Colo., Tex. w. to Wash., Oreg., Calif. Ecology: Found under rocks and in duff.

*Leptothorax (Leptothorax) nitens* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:318, 322. ♀.

*Leptothorax nitens occidentalis* Wheeler, 1903. Acad. Nat. Sci. Phila., Proc. 55:233, 245. ♀.

*Leptothorax nitens* var. *heathii* Wheeler, 1903. Acad. Nat. Sci. Phila., Proc. 55:223, 245. ♀.

Taxonomy: Cole, 1942. Amer. Midland Nat. 28:369-370. —Cole, 1958. Ent. Soc. Amer., Ann. 51:536. —Wheeler and Wheeler, 1973. Psyche 80: 71, 73 (larva).

Biology: Mallis, 1941. South. Calif. Acad. Sci., Bul. 40:73. —Gregg, 1963. Ants of Colo., pp. 382-384. —Wheeler and Wheeler, 1973. Ants of Deep Canyon, p. 96.

**obliquicanthus** Cole. Colo., N. Mex. Ecology: Found under stones in meadows and prairies.

*Leptothorax (Myrfant) obliquicanthus* Cole, 1953. Ent. Soc. Wash., Proc. 55:28-30. ♀.

Taxonomy: Gregg, 1953. Breviora 22:1-3.

Biology: Gregg, 1963. Ants of Colo., pp. 384-385, 387.

**obturator** Wheeler. Tex. Ecology: One colony was found in an oak gall.

*Leptothorax obturator* Wheeler, 1903. Acad. Nat. Sci. Phila., Proc. 55:224, 249. ♀, ♂, ♂.

Taxonomy: Wheeler and Wheeler, 1955. Ent. Soc. Amer., Ann. 48:24 (larva).

Biology: Wheeler, 1903. Amer. Mus. Nat. Hist., Bul. 19:663-664. —Wheeler, 1910. Ants, pp. 208-209.

**rugatulus brunnescens** Wheeler. N. Dak., Mont. s. to Colo., Utah. Ecology: Nests under rocks or wood. Sometimes not distinguished from the typical subspecies in the literature.

*Leptothorax rugatulus brunnescens* Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52:510. ♀.

*Leptothorax rugatulus dakotensis* Wheeler and Wheeler, 1944. N. Dak. Hist. Quart. 11:247. ♀.

Taxonomy: Wheeler and Wheeler, 1955. Ent. Soc. Amer., Ann. 48:25 (larva).

Biology: Gregg, 1963. Ants of Colo., pp. 388-389.

**rugatulus rugatulus** Emery. N. Dak., S. Dak., Colo., N. Mex. w. to B. C., Calif. Ecology: Nests under stones, wood, in decaying wood, in grasses.

*Leptothorax (Leptothorax) rugatulus* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:317, 321. ♀.

*Leptothorax curvispinosus rugatulus* var. *Cockerelli* Wheeler, 1903. Acad. Nat. Sci. Phila., Proc. 55:241. ♀, ♀.

*Leptothorax curvispinosus annectens* Wheeler, 1903. Acad. Nat. Sci. Phila., Proc. 55:242. ♀.

*Leptothorax rugatulus* var. *mediorufus* Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52:510. ♀, ♀.

Taxonomy: Wheeler, 1903. Acad. Nat. Sci. Phila., Proc. 55:223, 241. —Cole, 1942. Amer. Midland Nat. 28:369. —Creighton, 1950. Harvard Univ., Mus. Comp. Zool., Bul. 104:267-269.

Biology: Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52:509. —Cole, 1934. Psyche 41:222. —Cole, 1954. Tenn. Acad. Sci., Jour. 29:240. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 141-143 (does not distinguish subspecies). —Gregg, 1963. Ants of Colo., pp. 386-388.

**schaumi** Roger. Maine to Ga., w. to Iowa, Kans., Tex. Ecology: Commonly nests in the bark of trees.

*Leptothorax schaumii* Roger, 1863. Berlin. Ent. Ztschr. 7:180. ♀.

*Leptothorax fortinodis* Mayr, 1886 Zool.-Bot. Gesell. Wien, Verh. 36:451. ♀, ♀.

*Leptothorax fortinodis* var. *gilvus* Wheeler, 1903. Acad. Nat. Sci. Phila., Proc. 55:235. ♀, ♀.

*Leptothorax fortinodis* var. *melanoticus* Wheeler, 1903. Acad. Nat. Sci. Phila., Proc. 55:235. ♀, ♀.

Taxonomy: Wesson and Wesson, 1940. Amer. Midland Nat. 24:94-96. —Cole, 1940. Amer. Midland Nat. 24:56. —Creighton, 1950. Harvard Univ., Mus. Comp. Zool., Bul. 104:269-271. —Wheeler and Wheeler, 1960. Ent. Soc. Wash., Proc. 62:23 (larva).

Biology: Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21:385. —Wheeler, 1916. Ind. Acad. Sci., Proc. 26:461.

**schmittii** Wheeler. Colo. (Canyon City).

*Leptothorax Schmittii* Wheeler, 1903. Acad. Nat. Sci. Phila., Proc. 55:223, 242. ♀.

Taxonomy: Gregg, 1963. Ants of Colo., pp. 388, 390-391.

**silvestrii** (Santschi). S. Ariz. Ecology: Nests in evergreen oaks at altitudes of 3500 ft. or more.

*Tetramorium silvestrii* Santschi, 1909. Soc. Ent. Ital., Bol. 41:6. ♀.

Taxonomy: Creighton, 1953. Amer. Mus. Novitates 1635:1-7 (each caste described; note on habitat).

**stenotyle** Cole. Ariz. (nr. Rustler's Park, Chiricahua Mtns.). Ecology: Nests were found under stones.

*Leptothorax (Leptothorax) angustinodus* Cole, 1956. Tenn. Acad. Sci., Jour. 31:28-30. ♀, ♀. Preocc. by Stütz, 1917.

*Leptothorax (Leptothorax) stenotyle* Cole, 1956. Tenn. Acad. Sci., Jour. 31:214. N. name.

**terrigena** Wheeler. Tex. (Austin).

*Leptothorax terrigena* Wheeler, 1903. Acad. Nat. Sci. Phila., Proc. 55:224, 254. ♀, ♀.

**texanus davisii** Wheeler. N. Y., N. J., Fla.

*Leptothorax texanus davisii* Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21:385. ♀, ♀.

Taxonomy: Smith, 1952. N. Y. Ent. Soc., Jour. 60:104-106.

**texanus** Wheeler. Mich. (?), Ohio, s. to N. C., Ga. w. to Okla., Tex. Ecology: Nests have been found in sandy soil.

*Leptothorax texanus* Wheeler, 1903. Acad. Nat. Sci. Phila., Proc. 55:223-245. ♀, ♀, ♂.

Taxonomy: Gregg, 1944. Ent. Soc. Amer., Ann. 37:446. —Smith, 1952. N. Y. Ent. Soc., Jour. 60:102-104. —Wheeler and Wheeler, 1960. Ent. Soc. Wash., Proc. 62:24 (larva).

Biology: Smith, 1932. Ent. News 43:160. —Wesson and Wesson, 1940. Amer. Midland Nat. 24:98.

**tricarinatus neomexicanus** Wheeler. W. Colo., Utah, N. Mex., Ariz. Ecology: Nests found in soil, under stones, in open grassy areas.

*Leptothorax neomexicanus* Wheeler, 1903. Acad. Nat. Sci. Phila., Proc. 55:223-248. ♀.

Taxonomy: Smith, 1952. N. Y. Ent. Soc., Jour. 60:100-102.

Biology: Wheeler, 1906. Amer. Mus. Nat. Hist., Bul. 22:341. —Cole, 1953. Ent. Soc. Wash., Proc. 55:28. —Gregg, 1963. Ants of Colo., pp. 393-394.

**tricarinatus tricarinatus** Emery. N. Dak., S. Dak., Iowa w. to Wyo., Colo., Utah. Ecology: Nests under rocks and in soil.

*Leptothorax (Leptothorax) tricarinatus* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:318, 321. ♀.

Taxonomy: Wheeler, 1903. Acad. Nat. Sci. Phila., Proc. 55:223, 247-248. —Buren, 1944. Iowa State Col., Jour. Sci. 18:286, 288. —Smith, 1952. N. Y. Ent. Soc., Jour. 60:98-100 (worker, male).

Biology: Wheeler and Wheeler, 1963. Ants of N. Dak., p. 143. —Gregg, 1963. Ants of Colo., pp. 391-393.

**tuscaloosae** Wilson. N. C., Ala. Ecology: Colony was found in small cavity in soil under a bed of moss at base of an oak tree.

*Leptothorax (Myrafant) tuscaloosae* Wilson, 1950. Psyche 57:128-130. ♀, ♀.

**wheeleri** Smith. N. C., Ga., Fla., Ohio, Tenn., Ala., Miss. Ecology: Colonies found in cavities in trees and under bark.

*Leptothorax wheeleri* Smith, 1929. Ent. Soc. Amer., Ann. 22:547. ♀, ♀.

Taxonomy: Wilson, 1952. Ent. News 60:67-68, 70 (worker, male).

Biology: Smith, 1931. Ent. News 42:18. —Wesson and Wesson, 1940. Amer. Midland Nat. 24:90, 96.

### Genus LEPTOTHORAX Subgenus DICHOTHORAX Emery

*Leptothorax* subg. *Dichothorax* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:323.

Type-species: *Leptothorax (Dichothorax) pergandei* Emery. Desig. by Wheeler, 1911.

The status of the two forms below needs clarification. Though regarded as subspecies, the ranges overlap considerably.

Revision: Emery, 1895. Zool. Jahrb., Abt. f. System. 8:318, 323-324. —Wheeler, 1903. Acad. Nat. Sci. Phila., Proc. 55:224, 256-260.

**pergandei floridanus** Emery. N. J., N. C. to Fla., w. to Tex. Ecology: Has been found in stumps, logs, and nut shells.

*Leptothorax (Dichothorax) floridanus* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:318, 324. ♀.

*Leptothorax (Dichothorax) pergandei flavus* Smith, 1929. Ent. Soc. Amer., Ann. 22:549. ♀, ♀.

*Leptothorax (Dichothorax) pergandei floridanus* var. *spinus* Smith, 1929. Ent. Soc. Amer., Ann. 22:551. ♀.

Taxonomy: Smith, 1931. Ent. News 42:18-19.

Biology: Dennis, 1938. Ent. Soc. Amer., Ann. 31:290, 305.

**pergandei pergandei** Emery. D. C. s. to Ga., Tenn., w. to Nebr., Tex. Ecology: Apparently a ground nesting species.

*Leptothorax (Dichothorax) pergandei* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:318, 323. ♀.

*Leptothorax (Dichothorax) manni* Wesson, 1935. Ent. News 46:208. ♀, ♀, ♂. Preocc. by Wheeler, 1914.

Taxonomy: Wheeler, 1903. Acad. Nat. Sci. Phila., Proc. 55:224, 256-259 (worker, female).

—Smith, 1924. Ent. News 35:50. —Cole, 1940. Amer. Midland Nat. 24:56, 58. —Wheeler and Wheeler, 1960. Ent. Soc. Wash., Proc. 62:23 (larva).

Biology: Dennis, 1938. Ent. Soc. Amer., Ann. 31:290. —Buren, 1944. Iowa State Col., Jour. Sci. 18:288.

### Genus LEPTOTHORAX Subgenus LEPTOTHORAX Mayr

*Leptothorax* Mayr, 1855. Zool.-Bot. Gesell. Wien, Verh. 5:431.

Type-species: *Formica acervorum* Fabricius. Desig. by Bingham, 1903.

*Mychothorax* Ruzsky, 1904. Sapiski Imp. Russ. Geog. Obshch. 41:288.

Type-species: *Formica acervorum* Fabricius. Orig. desig.

In North America, this subgenus is confined mostly to the northern and western United States and Canada. The ants nest in living and dead trees, decaying wood, soil, or stumps. Some are inquiline in nests of other ants and some are dulotic.

Taxonomy: Brown, 1955. Ent. News 66:43-50. —Wheeler and Wheeler, 1955. Ent. Soc. Amer., Ann. 48:21-22 (larvae).

**crassipilis** Wheeler. Wyo., Colo., N. Mex., Utah, Ariz., Nev. Ecology: Found under rocks, under wood, in decaying logs.

*Leptothorax (Mychothorax) acervorum crassipilis* Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52:513. ♀, ♀, ♂.

Taxonomy: Cole, 1954. Tenn. Acad. Sci., Jour. 29:240-241.

Biology: Cole, 1953. Ent. Soc. Wash., Proc. 55:27. —Gregg, 1963. Ants of Colo., pp. 401-402, 405.

**diversipilosus** Smith. Wash. Ecology: An inquiline in nests of *Formica obscuripes* Forel.

*Leptothorax (Mychothorax) diversipilosus* Smith, 1939. Ent. Soc. Wash., Proc. 41:179. ♀, ergatoid ♀.

Taxonomy: Smith, 1956. Ent. Soc. Wash., Proc. 58:271-275 (female, ergatoid male).

Biology: Alpert and Akre, 1973. Ent. Soc. Amer., Ann. 66:753-760 (distribution, abundance, behavior).



- duloticus** Wesson. Mich., Ohio, Ill. (?). Ecology: Dulotic, enslaves *Leptothorax curvispinosus* Mayr and *L. longispinosus* Roger.  
*Leptothorax (Mychothorax) duloticus* Wesson, 1937. Ent. News 48:125. ♀, ♀.  
 Taxonomy: Wesson, 1940. Brooklyn Ent. Soc., Bul. 35:81-83 (male, biology).  
 Biology: Wesson and Wesson, 1940. Amer. Midland Nat. 24:94. —Talbot, 1957. Ecology 38:449-456 (populations). —Kannowski, 1959. Insectes Sociaux 6:124-215, 150-151 (parasitism).
- hirticornis** Emery. N. Dak., S. Dak., Colo., Utah., Calif. Ecology: An inquiline in nests of *Formica obscuripes* Forel and possibly *Formica integrroides integrroides* Emery.  
*Leptothorax (Leptothorax) hirticornis* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:317, 319. ♀.  
*Leptothorax (Leptothorax) hirticornis formidosus* Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34:415. ♀, ergatoid ♀.  
 Taxonomy: Wheeler, 1903. Acad. Nat. Sci. Phila., Proc. 55:223-224. —Smith, 1939. Ent. Soc. Wash., Proc. 41:176-179 (worker, ergatoid female).  
 Biology: Weber, 1935. Ecol. Monog. 5:200. —Wheeler and Wheeler, 1944. N. Dak. Hist. Quart. 11:248. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 145-146. —Gregg, 1963. Ants of Colo., pp. 403, 405. —Snelling, 1965. South. Calif. Acad. Sci., Bul. 64:16 (also description of dealate female and ergatoid male).
- muscorum** (Nylander). Newfoundland (Labrador) w. to N. W. T., Alaska, s. to Conn., Wis., N. Mex., Ariz., Calif.; Eurasia. Ecology: Has been found at 69° 22' N., Kilduit Bay on Richards Is., the northernmost record of any New World ant. Mostly found in woodlands, in decaying stumps, logs, under bark of fallen trees, or under rocks. It is best able to survive in extreme arctic conditions under stones.  
*Myrmica muscorum* Nylander, 1846. Acta Soc. Sci. Fenn. 2:1054. ♀, ♀, ♂.  
*Leptothorax canadensis* Provancher, 1887. Addit. Corr. Faune Ent. Canada, Hym. p. 245. ♀, ♀, ♂.  
*Leptothorax (Leptothorax) canadensis* var. *yankee* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:317, 319. ♀, ♀.  
*Leptothorax yankee* var. *kincaidi* Pergande, 1900. Wash. Acad. Sci., Proc. 2:520. ♀, ♀.  
*Leptothorax muscorum* var. *sordidus* Wheeler, 1903. Acad. Nat. Sci. Phila., Proc. 55:223, 224. ♀.  
*Leptothorax acervorum canadensis* var. *convivialis* Wheeler, 1903. Acad. Nat. Sci. Phila., Proc. 55:228. ♀, ♀.  
*Leptothorax canadensis obscurus* Viereck, 1903. Amer. Ent. Soc., Trans. 29:72. ♀.  
*Leptothorax (Leptothorax) acervorum canadensis* var. *Calderoni* Forel, 1914. Deut. Ent. Ztschr., p. 617. ♀, ♀.  
*Leptothorax (Mychothorax) muscorum* var. *septentrionalis* Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52:511. ♀, ♀, ♂.  
 Taxonomy: Wheeler, 1903. Acad. Nat. Sci. Phila., Proc. 55:223, 225-229. —Wheeler, 1917. Conn. State Geol. and Nat. Hist. Survey Bul. 22:588. —Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52:512-513. —Brown, 1955. Ent. News 66:47-50 (also ecology). —Wheeler and Wheeler, 1955. Ent. Soc. Amer., Ann. 48:21 (larva). —Francoeur and Beique, 1966. Canad. Ent. 98:142 (Provancher ant types).  
 Biology: Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:621. —Wheeler and Wheeler, 1944. N. Dak. Hist. Quart. 11:247-248. —Mallis, 1941. South. Calif. Acad. Sci., Bul. 40:73. —Cole, 1942. Amer. Midland Nat. 28:369-370. —Gregg, 1946. Amer. Midland Nat. 35:748. —Kannowski, 1959. Insectes Sociaux 6:125. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 143-145. —Gregg, 1963. Ants of Colo., pp. 393-400. —Chapman, 1969. Ent. Soc. Amer., Ann. 62:1256-1259 (release and recovery of marked winged forms). —Möglich, Machwitz, and Holldobler, 1974. Science 186: 1046-1047 (tandem calling).

- provancheri** Emery. Que., Maine w. to Alta., N. Dak., Colo., N. Mex. Ecology: Apparently an inquiline, found in nests of *Myrmica incompleta incompleta* Provancher and *M. lobicornis fracticornis* Emery.
- Leptothorax (Leptothorax) provancheri* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:317, 320. ♀.
- Leptothorax emersoni* Wheeler, 1901. Amer. Nat. 35:433. ♀, ♀, ♂.
- Leptothorax emersoni glacialis* Wheeler, 1907. Wis. Nat. Hist. Soc., Bul. (n. s.) 5:71. ♀, ♀, ♂.
- Leptothorax (Mychothorax) emersoni hirtipilis* Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52:515. ♀.
- Taxonomy: Wheeler, 1903. Acad. Nat. Sci. Phila., Proc. 55:223, 229. —Cole, 1954. Tenn. Acad. Sci., Jour. 29:241. —Wheeler and Wheeler, 1973. Psyche 80: 73-74 (larva).
- Biology: Wheeler, 1907. Wis. Nat. Hist. Soc., Bul. (n. s.) 5:78-83. —Wheeler, 1910. Ants, pp. 107, 393, 434-436. —Wheeler, 1901. Amer. Nat. 35:436-438. —Wheeler, 1903. Jour. Psychol. and Neurol. 2:1-21. —Kannowski, 1957. Psyche 64:1-5. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 146-148. —Gregg, 1963. Ants of Colo., pp. 404-407.

#### Genus SYMMYRMICA Wheeler

- Symmyrmica* Wheeler, 1904. Amer. Mus. Nat. Hist., Bul. 20:1, 3.
- Type-species: *Symmyrmica chamberlini* Wheeler. Monotypic.
- Taxonomy: Brown, 1973. In Meggers et al., Tropical Forest Ecosystems in Afr. and S. Amer., p. 185 (possible syn. of *Leptothorax*).
- chamberlini** Wheeler. Utah, Oreg. Ecology: An inquiline in nest of *Manica mutica* (Emery).
- Symmyrmica chamberlini* Wheeler, 1904. Amer. Mus. Nat. Hist., Bul. 20:5. ♀, ♀, apterous ergatoid ♂.
- Biology: Wheeler, 1910. Ants, pp. 432-434. —Wheeler, 1919. Amer. Phil. Soc., Proc. 58:22.

#### Genus HARPAGOXENUS Forel

- Tomognathus* Mayr, 1861. Die Europaischen Formiciden, pp. 29, 56. Preocc. by Dixon, 1850.
- Type-species: *Myrmica sublaevis* Nylander. Monotypic.
- Harpagoxenus* Forel, 1893. Soc. Ent. de Belg., Ann. 37:167. N. name for *Tomognathus*.
- Protomognathus* Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21:3.
- Type-species: *Tomognathus americanus* Emery. Monotypic.
- Ants of this genus are dulotic, enslaving and conducting raids on colonies of certain species of *Leptothorax*. There is a single European species.
- Revision: Smith, 1939. Ent. Soc. Wash., Proc. 41:165-172.
- Taxonomy: Wheeler and Wheeler, 1955. Ent. Soc. Amer., Ann. 48:26-28 (larvae).
- americanus** (Emery). Mass., Ont. s. to N. C., w. to Ill., Mo. Ecology: Enslaves *Leptothorax curvispinosus* Mayr and *L. longispinosus* Roger.
- Tomognathus americanus* Emery, 1895. Zool. Jahrb., Abt. f. System. 8: 272 ♀.
- Taxonomy: Creighton, 1927. Psyche 34:28 (male). —Smith, 1939. Ent. Soc. Wash., Proc. 41:166-168 (each caste). —Wheeler and Wheeler, 1955. Ent. Soc. Amer., Ann. 48:26-27 (larva).
- Biology: Sturtevant, 1927. Psyche 34:1-9. —Creighton, 1927. Psyche 34:11-29. —Creighton, 1923. Psyche 36:48-50. —Wesson, 1939. Amer. Ent. Soc., Trans. 65:97-122.
- canadensis** Smith. N. S., Que., Maine w. to Mich., Minn. Ecology: Enslaves *Leptothorax muscorum* (Nylander). Apparently closely related to the Palearctic *H. sublaevis* (Nylander) and like that form has ergatoid females in addition to normal workers and females.
- Harpagoxenus canadensis* Smith, 1939. Ent. Soc. Wash., Proc. 41:168. ♀, ergatoid ♀.
- Taxonomy: Gregg, 1945. Canad. Ent. 77:74-76.

Biology: Gregg, 1946. Amer. Midland Nat. 35:748.

### TRIBE MYRMECININI

#### Genus MYRMECINA Curtis

*Myrmecina* Curtis, 1829. Brit. Ent. 6:226, pl. 265.

Type-species: *Myrmecina latreillei* Curtis. Orig. desig.

*Archaeomyrmex* Mann, 1921. Harvard Univ., Mus. Comp. Zool., Bul. 64:448, 451.

Type-species: *Archaeomyrmex cacabau* Mann. Orig. desig.

Apparently only one species occurs in North America, though several subspecies are sometimes recognized.

Revision: Emery, 1895. Zool. Jahrb., Abt. f. System. 8:271. —Smith, 1948. Ent. Soc. Wash., Proc. 50:238-240. —Snelling, 1965. South. Calif. Acad. Sci., Bul. 64:101-105. —Brown, 1967. Ent. News 78:233-230.

Taxonomy: Brown, 1951. Brooklyn Ent. Soc., Bul. 46:103-106. —Wheeler and Wheeler, 1954. Ent. Soc. Wash., Proc. 56:129-131 (larvae). —Brown, 1971. Breviora 365:1-2 (generic syn.).

*americana* Emery. Que. s. to Ga., w. to Iowa, Colo., N. Mex., Ariz., Calif. Ecology: Colonies are small and nests are obscure, usually built in moist shady areas often under small stones.

*Myrmecina latreillei americana* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:271. ♀.

*Myrmecina latreillei americana* var. *brevispinosa* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:271. ♀, ♀, ♂.

*Myrmecina graminicola texana* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:422. ♀.

*Myrmecina graminicola quadrispinosa* Enzmann, 1946. N. Y. Ent. Soc., Jour. 54:13. ♀.

*Myrmecina californica* Smith, 1948. Ent. Soc. Wash., Proc. 50:239. ♀.

Taxonomy: Cole, 1940. Amer. Midland Nat. 24:39. —Buren, 1944. Iowa State Col., Jour. Sci. 18:290. —Brown, 1949. Psyche 56:44-47. —Brown, 1951. Brooklyn Ent. Soc., Bul. 46:103-106. —Wheeler and Wheeler, 1954. Ent. Soc. Wash., Proc. 56:130 (larva). —Francoeur, 1966. Nat. Canad. 93:439.

Biology: Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21:373, 376. —Wheeler, 1906. Amer. Mus. Nat. Hist., Bul. 22:332, 335-336. —Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52:502. —Talbot, 1934. Ecology 15:420, 427-428. —Dennis, 1938. Ent. Soc. Amer., Ann. 31:274, 278-279, 304. —Gregg, 1963. Ants of Colo., pp. 364-365, 367.

### TRIBE TETRAMORIINI

Revision: Bolton, 1976. Brit. Mus. (Nat. Hist.) Ent., Bul. 34: 283-379.

#### Genus TRIGLYPHOTHRIX Forel

*Triglyphothrix* Forel, 1890. Soc. Ent. de Belg., Ann. 34: CVI.

Type-species: *Triglyphothrix walshi* Forel. Monotypic.

A single introduced form is established in a number of localities in southeastern United States. The genus is native to Africa and southern Asia.

Revision: Bingham, 1903 Fauna Brit. India, Hym. 2:172-175. —Bolton, 1976. Brit. Mus. (Nat. Hist.) Ent., Bul. 34: 310-359 (world species).

*lanuginosa* (Mayr). S. C., Ga., Fla., Ala., Miss., La.; pantropical. Introduced, probably native to India. Spread by commerce to most tropical regions of the world.

*Tetramorium lanuginosa* Mayr, 1870. Zool.-Bot. Gesell. Wien, Verh. 20: 972, 976. ♀.

*Tetramorium obesum* race *striatidens* Emery, 1889. Ann. Mus. Civ. Stor. Nat. Genova 7:501. ♀.

Taxonomy: Wheeler, 1912. N. Y. Ent. Soc., Jour. 20:46. —Wheeler, 1916. Jour. Econ. Ent. 9:568-569 (first notice of occurrence in U. S.). —Wilson and Taylor, 1967. Pacific Ins. Monog. 14:70. —Wheeler and Wheeler, 1973. Psyche 80: 78 (larva). —Bolton, 1976. Brit. Mus. (Nat. Hist.) Ent., Bul. 34: 350-352 (further synonymy).

Biology: Donisthorpe, 1927. British Ants, p. 393. —Smith, 1931. Ent. News 42:21.

Genus **TETRAMORIUM** Mayr

*Tetramorium* Mayr, 1855. Zool.-Bot. Gesell. Wien, Verh. 5:423.

Type-species: *Formica caespitum* Linnaeus. Desig. by Girard, 1879.

*Tetrogmus* Roger, 1857. Berlin. Ent. Ztschr. 1:10.

Type-species: *Tetrogmus caldarius* Roger. Monotypic.

*Tetramorium* subg. *Xiphomyrmex* Forel, 1887. Schweiz. Ent. Gesell. Mitt. 7: 385.

Type-species: *Tetramorium (Xiphomyrmex) kelleri* Forel. Desig. by Wheeler, 1911.

This genus is better represented in Asia and Africa than in North America. Three of the four species, *guineense*, *pacificum*, and *simillimum*, are, with little question, introduced; the other, *caespitum*, which is also found in Europe, is generally believed to be native, though some workers also consider it as being introduced. This genus contains some important house pests.

Revision: Mayr, 1870. Zool.-Bot. Gesell. Wien, Verh. 20:972-977. —Bingham, 1903. Fauna British India, Hym. 2:175-189. —Emery, 1916. Soc. Ent. Ital., Bol. 47:195. —Smith, 1938. Wash. Acad. Sci., Jour. 28: 126-130 (*Xiphomyrmex*). —Smith, 1943. Ent. Soc. Wash., Proc. 45:1-5 (U. S. species).

Taxonomy: Wheeler and Wheeler, 1954. Amer. Midland Nat. 52: 445, 450 (larvae). —Cole, 1957. Tenn. Acad. Sci., Jour. 32: 209-219 (male, *Xiphomyrmex*). —Brown, 1957. Breviora 72:1-8 (native in N. Amer. ?). —Bolton, 1976. Brit. Mus. (Nat. Hist.) Ent., Bul. 34: 288, 359-365 (generic synonymy).

**caespitum** (Linnaeus). Ont. s. to Tenn., w. to Nebr., Mo., Wash., Nev., Calif.; Eurasia, Africa.

Ecology: One of the most common house-infesting ants in the large cities of the Atlantic coast. They also steal seeds from seedbeds, gnaw into tubers, roots, and stalks of various plants, attend honeydew excreting insects, and serve as an intermediate host for poultry tapeworms. Colonies are populous and nests may be in exposed soil, under cover of stones, pavement, or other objects, in rotting wood, or next to building foundations. Possibly introduced by early colonists from Europe but believed by some to be a native species. Parasite: *Anergates atratulus* (Schenck), *Strongylognathus* sp. Pavement ant.

Most common in the Atlantic seaboard states and more sparsely distributed inland.

*Formica caespitum* Linnaeus, 1758. Syst. Nat., ed. 10, v. 1, p. 581.

*Myrmica (Myrmica) brevinodis* var. *transversinodis* Enzmann, 1946. N. Y. Ent. Soc., Jour. 54:47. ♀.

Taxonomy: Mayr, 1870. Zool.-Bot. Gesell. Wien, Verh. 20:972. —Donisthorpe, 1927. British Ants, p. 189 (each caste). —Smith, 1943. Ent. Soc. Wash., Proc. 45:2. —Brown, 1949. Psyche 56:47. —Wheeler and Wheeler, 1954. Amer. Midland Nat. 52:445 (larva). —Wheeler and Wheeler, 1960. Ent. Soc. Wash., Proc. 62:24-25 (larva). —Wheeler and Wheeler, 1973. Psyche 80: 76, 78 (larva).

Biology: Smith, 1915. Va. Truck Expt. Sta., Bul. 16:1-15. —Wheeler, 1919. Amer. Phil. Soc., Proc. 58:23-26. —Wheeler, 1927. Psyche 34:164-165. —Donisthorpe, 1927. British Ants, pp. 193-198. —Metcalf and Flint, 1939. Destructive and Useful Insects, p. 771. —Mallis, 1941. South. Calif. Acad. Sci., Bul. 40:74. —Brown, 1964. Ent. News 75:15. —Brown, 1957. Breviora 72:1-4 (historical). —Smith, 1965. U. S. Dept. Agr., Tech. Bul. 1326:45-47 (economic importance). —Lange, 1961. Jour. Econ. Ent. 54:1063. —Poldi, 1963. Pavia Univ. Symposium Genet. et Biol. Ital. 12:132. —Weber, 1965. Ent. News 76: 137-139 (in Philadelphia area). —Brian, Elmes, and Kelley, 1967. Jour. Anim. Ecol. 36:337-342 (populations). —Bruder and Gupta, 1972. Ent. Soc. Amer., Ann. 65:358-367. —Gurney, 1975. Ins. World Digest 2 (5): 19-25 (stinging habits).

**guineense** (Fabricius). Ga., Fla. w. to Tex.; pantropical. Ecology: Nests in small to moderate colonies in exposed soil, under stones or other objects, in rotting logs and stumps, in stems of plants, and in branches and under bark of trees. Occasionally a house pest.

Introduced, spread throughout the tropical regions of the world by commerce.

Occasionally found in greenhouses farther north in N. Amer. Guinea ant.

*Formica guineensis* Fabricius, 1793. Ent. System. 2:357. ♀.

Taxonomy: Emery, 1909. Deut. Ent. Ztschr., p. 695 (each caste). —Smith, 1936. Puerto Rico Univ., Jour. Agr. 20:831, 852. —Smith, 1943. Ent. Soc. Wash., Proc. 45:3. —Wilson and

Taylor, 1967. Pacific Ins. Monog. 14:71-72 (Polynesia). —Wheeler and Wheeler, 1954. Amer. Midland Nat. 52:449-450 (larva).

Biology: Marlatt, 1928. U. S. Dept. Agr., Farmers' Bul. 740:6. —Phillips, 1934. (Hawaii Univ.) Expt. Sta. Pineapple Prod. Coop. Assoc. Bul. 15:23-24. —Smith, 1943. Ent. Soc. Wash., Proc. 45:1-2. —Brown, 1958. Acta Hym. 1:28. —Taylor and Wilson, 1961. Psyche 68:138. —Brown, 1964. Ent. News 75:14-15. —Smith, 1965. U. S. Dept. Agr., Tech. Bul. 1326:47-48 (economic importance).

Morphology: Blum and Ross, 1965. Jour. Ins. Physiol. 11:857-868 (odor trail pheromone).

**pacificum** Mayr. Calif.; Oriental and Australian Regions. Introduced into a nursery in Calif; may not be established.

*Tetramorium pacificum* Mayr, 1870. Zool.-Bot. Gesell. Wien, Verh. 20:972, 976. ♀, ♀.

Taxonomy: Smith, 1943. Ent. Soc. Wash., Proc. 45:2-3. —Wilson and Taylor, 1967. Pacific Ins. Monog. 14:72-73 (Polynesia).

**simillimum** (Smith). Ga., Fla.; Panropical. Introduced, a tramp species probably native to Africa. Occasionally found in greenhouses farther north in N. Amer.

*Myrmica simillima* Smith, 1851. List Hym. Brit. Mus. v. 6, p. 118. ♀.

Taxonomy: Emery, 1909. Deut. Ent. Ztschr., pp. 695-696 (each caste). —Smith, 1936. Puerto Rico Univ., Jour. Agr. 20:831, 853. —Smith, 1943. Ent. Soc. Wash., Proc. 45:2. —Wilson and Taylor, 1967. Pacific Ins. Monog. 14:73 (Polynesia).

Biology: Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21:101. —Marlatt, 1928. U. S. Dept. Agr., Farmers' Bul. 740:6. —Smith, 1933. Fla. Ent. 17:24. —Phillips, 1934. (Hawaii Univ.) Expt. Sta. Pineapple Prod. Coop. Assoc. Bul. 15:24. —Taylor and Wilson, 1961. Psyche 68:142-143.

**spinosus hispidus** (Wheeler). S. Ariz. Ecology: Found nesting in small craters in the desert. *X. spinosus spinosus* Pergande occurs in Mexico.

*Xiphomyrmex spinosus hispidus* Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34:415. ♀.

**spinosus insons** (Wheeler). W. Tex., Ariz. Ecology: Nests found in small craters in dry, grassy areas.

*Xiphomyrmex spinosus insons* Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34:416. ♀, ♀, ♂.

**spinosus wheeleri** Forel. S. Ariz.; Mexico. Ecology: One colony was found beneath a stone in a cactus desert.

*Tetramorium (Xiphomyrmex) wheeleri* Forel, 1901. Soc. Ent. de Belg., Ann. 45:128. ♀.

Biology: Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34:416.

### Genus ANERGATES Forel

*Anergates* Forel, 1874. Schweiz. Naturf. Gesell. Denkschr. 26:93.

Type-species: *Myrmica atratula* Schenck. Monotypic.

The single species of this genus is a permanent parasite.

**atratulus** (Schenck). Conn., N. Y., N. J., Pa., Del., Md., D. C., Va.; Europe. Ecology: A parasitized nest of the host consists of a single fertile female of *atratulus*, a large number of host workers, and a large number of pupoidal males and virgin females of *atratulus*. Workers of the parasite are entirely lacking. Possibly introduced with its host from Europe, though some workers are of the opinion that the host and *atratulus* are native. Host: *Tetramorium caespitum* (L.).

*Myrmica atratula* Schenck, 1852. Nassau. Ver. f. Naturk. Jahrb. 8:91. ♀.

*Anergates friedlandi* Creighton, 1934. Psyche 41:193. ♀.

Taxonomy: Emery, 1922. In Wytsman, Gen. Ins., fasc. 174:205-206 (female, male).

—Donisthorpe, 1927. British Ants, pp. 96-97 (female, male). —Wheeler and Wheeler, 1955. Amer. Midland Nat. 54:128-130 (larva). —Ettershank, 1966. Austral. Jour. Zool. 14:157-158.

Biology: Wheeler, 1910. Ants, pp. 498-504. —Donisthorpe, 1915. British Ants, p. 89.

—Wheeler, 1923. Social life Among the Insects, pp. 215-219. —Creighton, 1950. Harvard Univ., Mus. Comp. Zool., Bul. 104:241-243.

Morphology: Meyer, 1955. Insectes Sociaux 2:163-170.

## TRIBE OCHETOMYRMICINI

## Genus OCHETOMYRMEX Mayr

*Ochetomyrmex* Mayr, 1877. Zool.-Bot. Gesell. Wien, Verh. 27:871.

Type-species: *Ochetomyrmex semipolitus* Mayr. Monotypic.

*Wasmannia* Forel, 1893. London Ent. Soc., Trans. 4:383.

Type-species: *Tetramorium? auropunctatum* Roger. Desig. by Wheeler, 1911.

*Blepharidatta* Wheeler, 1915. Harvard Univ., Mus. Comp. Zool., Bul. 59:484.

Type-species: *Blepharidatta brasiliensis* Wheeler. Monotypic.

*Hercynia* Enzmann, 1947. N. Y. Ent. Soc., Jour. 55:43. Preocc. by Rafinesque, 1815.

Type-species: *Hercynia panamana* Enzmann. Monotypic.

A single species of this Neotropical genus has been introduced into the United States.

Taxonomy: Brown, 1948. Ent. News 59:102. —Brown, 1973. In Meggers, *et al.*, Tropical Forest Ecosystems in Afr. and S. Amer., pp. 178-185 (generic syn.).

*auropunctata* (Roger). Fla., Calif.; W. Indies, Mexico, Central and S. Amer. Ecology: Nests in exposed soil, under cover of objects, or in wood. Attends honeydew excreting insects, can sting severely, and infests houses. Introduced. Little fire ant.

*Tetramorium? auropunctatum* Roger, 1863. Berlin. Ent. Ztschr. 7:182. ♀, ♀, ♂.

*Wasmannia? glabra* Santschi, 1931. Rev. Ent. Sao Paulo 1:272. ♀.

*Hercynia panamana* Enzmann, 1947. N. Y. Ent. Soc., Jour. 55:44. ♀, ♀.

Taxonomy: Smith, 1929. Jour. Econ. Ent. 22:243. —Smith, 1936. Puerto Rico Univ., Jour. Agr. 20:831, 854. —Brown, 1948. Ent. News 59:102. —Smith, 1954. Amer. Mus. Novitates 1671:7-8. —Wheeler and Wheeler, 1954. Amer. Midland Nat. 52:444 (larva). —Kempf, 1964. Studia Ent. 7:66.

Biology: Wheeler, 1929. Psyche 36:89-90. —Spencer, 1941. Fla. Ent. 24:6-14. —Fernald, 1947. Jour. Econ. Ent. 40:428. —Osburn, 1948. Fla. Ent. 31:11-15. —Smith, 1965. U. S. Dept. Agr., Tech. Bul. 1326:48-49 (economic importance).

## TRIBE CEPHALOTINI

Revision: Kempf, 1951. Rev. de Ent. 22:1-244.

Taxonomy: Kempf, 1958. Studia Ent. 1:1-168. —Kempf, 1973. Studia Ent. 16: 449-462 (generic classification; key to genera).

## Genus ZACRYPTOCERUS Wheeler

*Zacryptocerus* Ashmead, 1905. Canad. Ent. 37: 384. Nomen nudum. No description given; the type-species is given as *Cryptocerus multistrigus* F. Smith, but no such species exists.

*Zacryptocerus* Wheeler, 1911. N. Y. Acad. Sci., Ann. 21: 175.

Type-species: *Cryptocerus clypeatus* Fabricius. Monotypic.

*Cryptocerus* subg. *Paracryptocerus* Emery, 1915. Soc. Ent. de France, Bul., p. 192.

Type-species: *Cryptocerus spinosus* Mayr. Orig. desig.

*Cryptocerus* subg. *Cyathocephalus* Emery, 1915. Soc. Ent. de France, Bul., p. 192. Preocc. by Kessler, 1868.

Type-species: *Cryptocerus pallens* Klug. Orig. desig.

*Cryptocerus* subg. *Hypocryptocerus* Wheeler, 1920. Psyche 27: 53.

Type-species: *Formica haemorrhoidalis* Latreille, Orig. desig.

*Cyathomyrmex* Creighton, 1933. Psyche 40:98. N. name for *Cyathocephalus* Emery.

*Paracryptocerus* subg. *Harnedia* Smith, 1949. Psyche 56:20.

Type-species: *Cryptocerus umbraculatus* Fabricius. Orig. desig.

Mainly Neotropical with slight extensions into the United States. The ants are arboreal, forming small colonies in cavities of plants, especially twigs. Food consists largely of honeydew and small arthropods. The soldier is believed to keep intruders from the nest by blocking the entrance hole with its head.

Revision: Smith, 1947. Ent. Soc. Wash., Proc. 49:29-40. —Kempf, 1958. Studia Ent. 1:65-158.

- Taxonomy: Kempf, 1951. Rev. de Ent. 22:156-157, 233. —Wheeler and Wheeler, 1954. Wash. Acad. Sci., Jour. 44:156-157 (larvae). —Kempf, 1973. Studia Ent. 16: 457-460 (syn. of *Paracryptocerus* and *Hypocryptocerus*).
- rohweri** (Wheeler), n. comb. S. Ariz.; Mexico. Ecology: Arboreal.  
*Cryptocerus (Cyathocephalus) rohweri* Wheeler, 1916. New England Zool. Club, Proc. 6:32. ♀, 2.
- Taxonomy: Kempf, 1958. Studia Ent. 1:129-132. —Snelling, 1968. Los Angeles Co., Mus., Contrib. Sci. 132:5-9.
- Biology: Smith, 1947. Ent. Soc. Wash., Proc. 49:34-37. —Creighton and Nutting, 1965. Psyche 72: 59-64 (habits and distribution).
- texanus** (Santschi), n. comb. S. Tex.; Mexico. Ecology: Arboreal.  
*Cryptocerus texanus* Santschi, 1915. Soc. Ent. de France, Bul., p. 208. ♀, 2.
- Taxonomy: Kempf, 1958. Studia Ent. 1:123-127.
- Biology: Smith, 1947. Ent. Soc. Wash., Proc. 49:37-40. —Creighton, 1954. Psyche 61:41-57. —Creighton, 1963. Psyche 70:133-143.
- varians** (Smith), n. comb. Fla.; Central Amer., W. Indies. Ecology: Arboreal.  
*Cryptocerus varians* Smith, 1876. London Ent. Soc., Trans., p. 606. ♀.  
*Cryptocerus (Cyathocephalus) varians* var. *jamaicensis* Forel, 1922. Rev. Suisse de Zool. 30:97. ♀.
- Taxonomy: Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21:102-104. —Wheeler and Wheeler, 1954. Wash. Acad. Sci., Jour. 44:156 (larva). —Kempf, 1958. Studia Ent. 1:155-158.
- Biology: Wheeler, 1932. N. Y. Ent. Soc., Jour. 40:11. —Smith, 1947. Ent. Soc. Wash., Proc. 49:33.

#### TRIBE DACETINI

- Taxonomy: Brown, 1948. Amer. Ent. Soc., Trans. 74:101-129 (preliminary generic revision of higher Dacetini). —Brown, 1949. Amer. Ent. Soc., Trans. 75:43-51. —Brown, 1953. Amer. Midland Nat. 50:1-137 (revisionary studies). —Wheeler and Wheeler, 1954. Psyche 61:111-145 (larvae). —Brown and Wilson, 1959. Quart. Rev. Biol. 34:278-294 (evolution of dacetine ants).

#### Genus STRUMIGENYS Smith

*Strumigenys* Smith, 1860. Jour. Ent. (London) 1:72.

Type-species: *Strumigenys mandibularis* Smith. Monotypic.

*Labidogenys* Roger, 1862. Berlin. Ent. Ztschr. 6:249.

Type-species: *Labidogenys lyroessa* Roger. Monotypic.

*Pyramica* Roger, 1862. Berlin. Ent. Ztschr. 6:251.

Type-species: *Pyramica gundlachi* Roger. Monotypic.

*Proscopomyrmex* Patrizi, 1946. Bol. Inst. Ent. R. Univ. Bologna 15:294.

Type-species: *Proscopomyrmex londianensis* Patrizi. Monotypic.

*Eneria* Donisthorpe, 1947. Ann. and Mag. Nat. Hist. 14:598.

Type-species: *Eneria excisa* Donisthorpe. Monotypic.

This genus is best represented in the tropical regions of the world; over 50 species are known from the New World, but only four of these have been recorded from the United States. Three of these four species are believed to have been introduced. Colonies are small and nests are usually found in leaf litter, plant cavities, rotting wood, or under objects.

Revision: Emery, 1895. Zool. Jahrb., Abt. f. System. 8:325-326. —Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:145-147. —Smith, 1931. Ent. Soc. Amer., Ann. 24:688-691 (N. Amer.). —Brown, 1962. Psyche 69:238-267 (Neotropical species and key).

Taxonomy: Brown, 1948. Amer. Ent. Soc., Trans. 74:108. —Brown, 1949. Mushi 20:14. —Wheeler and Wheeler, 1954. Psyche 61:135 (larvae). —Wheeler and Wheeler, 1960. Ent. Soc. Wash., Proc. 62:25-26 (larvae). —Brown, 1959. Studia Ent. (n. s.) 2:25-30 (*silvestrii* group). —Brown, 1960 (1959). Psyche 66:37-52 (*gundlachi* group).

Biology: Brown, 1950. Brooklyn Ent. Soc., Bul. 45:87-89. —Brown and Wilson, 1960 (1959). Quart. Rev. Biol. 34:281.

## SPECIES GROUP SILVESTRII

**silvestrii** Emery. La. (Paradise); Brazil, Argentina, Cuba. Ecology: In La. found in a basal rot hole in a live oak tree. Probably introduced.

*Strumigenys silvestrii* Emery, 1905. Soc. Ent. Ital., Bol. 37:168. ♀, ♀.

*Strumigenys (Strumigenys) caribbea* Weber, 1934. Rev. de Ent. 4:43. ♀, ♀.

Taxonomy: Brown, 1959. Studia Ent. (n. s.) 2:25-28. —Brown, 1962. Psyche 69:246, 257, 259.

## SPECIES GROUP LOUISIANAE

**louisianae** Roger. N. C. to Fla., w. to Okla., Ariz.; Mexico s. to Bolivia, Argentina. Ecology:

The small colonies are beneath objects, in rotting wood, plant cavities; food consists of small arthropods, especially Collembola.

*Strumigenys louisianae* Roger, 1863. Berlin. Ent. Ztschr. 7:211. ♀.

*Strumigenys unidentata* Mayr, 1887. Zool.-Bot. Gesell. Wien, Verh. 37:570, 575. ♀.

*Strumigenys unispinulosa* Emery, 1890. Soc. Ent. Ital., Bol. 22:67. ♀, ♀.

*Strumigenys unispinulosa* var. *longicornis* Emery, 1894. Soc. Ent. Ital., Bol. 26:214. ♀.

*Strumigenys fusca* Emery, 1894. Soc. Ent. Ital., Bol. 26:215. ♀.

*Strumigenys louisianae* var. *obscuriventris* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:145. ♀.

*Strumigenys bruchi* Forel, 1912. Soc. Ent. de Belg., Mem. 29:197-198. ♀, ♂.

*Strumigenys infidelis* Santschi, 1919. Soc. Cient. Argentina, An. 87:48. ♀.

*Strumigenys eggersi* var. *cubaensis* Mann, 1920. Amer. Mus. Nat. Hist., Bul. 42:430. ♀.

*Strumigenys (Strumigenys) louisianae laticephala* Smith, 1931. Ent. Soc. Amer., Ann. 24:688, 690. ♀.

*Strumigenys (Strumigenys) louisianae soledadensis* Weber, 1934. Rev. de Ent. 4:38-39. ♀, ♀.

*Strumigenys (Strumigenys) louisianae guatemalensis* Weber, 1934. Rev. de Ent. 4:39. ♀.

*Strumigenys (Strumigenys) louisianae costaricensis* Weber, 1934. Rev. de Ent. 4:39. ♀.

*Strumigenys clasmospungia* Brown, 1953. Psyche 60:2. ♀.

Taxonomy: Emery, 1895. Zool. Jahrb., Abt. f. System. 8:325-326. —Wheeler, 1908. Amer.

Mus. Nat. Hist., Bul. 24:147. —Haug, 1932. Ent. Soc. Amer., Ann. 25:170-172. —Brown, 1953. Amer. Midland Nat. 50:28-31. —Brown, 1953. Psyche 60:1-2. —Wheeler and Wheeler, 1954. Psyche 61:136-137 (larva). —Brown, 1957. Quart. Rev. Biol. 32:271. —Brown, 1961. Psyche 68: 64-67, 68 (variation and syn.). —Brown, 1962. Psyche 69:246-247, 257, 263.

Biology: Smith, 1931. Ent. Soc. Amer., Ann. 24:690-691. —Creighton, 1937. Psyche 44:97-109.

—Dennis, 1938. Ent. Soc. Amer., Ann. 31:269, 291, 305. —Wilson, 1950. Brooklyn Ent. Soc., Bul. 45:85-86. —Wilson, 1953. Ent. Soc. Amer., Ann. 46:481-483. —Kempf, 1958. Studia Ent. 1:555.

## SPECIES GROUP GUNDLACHI

**eggersi** Emery. Fla. (Miami, Fisher's Is., Archbold Biol. Sta.); W. Indies, Mexico, S. Amer. Probably introduced.

*Strumigenys eggersi* Emery, 1890. Soc. Ent. Ital., Bol. 22:68. ♀, ♀.

Taxonomy: Brown, 1960 (1959). Psyche 66:46-47 (worker, female). —Brown, 1962. Psyche 69:249, 257, 264.

Biology: Weber, 1952. Amer. Mus. Novitates 1554:5. —Kempf, 1958. Studia Ent. 1:554.

—Kempf, 1961. Studia Ent. 4:515.

**gundlachi** (Roger). Fla. (Royal Palm Ranger Sta., Everglades Natl. Pk.; Key Largo); W. Indies, Mexico, Central Amer. Ecology: Usually found in leaf litter; feeds almost exclusively on Collembola. Probably introduced.

*Pyramica gundlachi* Roger, 1862. Berlin. Ent. Ztschr. 6:253. "♀" = ♀.

*Strumigenys eggersi* var. *vincentensis* Forel, 1893. London Ent. Soc., Trans. p. 378. ♀.



*Strumigenys eggersi* var. *banillensis* Santschi, 1930. Soc. Roy. Ent. d'Egypte, Bul. (n. s.), p. 80. ♀.

*Strumigenys bierigi* Santschi, 1930. Soc. Roy. Ent. d'Egypte, Bul. (n. s.), p. 80. ♀.

*Strumigenys (Strumigenys) eggersi* var. *isthmica* Santschi, 1931. Rev. de Ent. 1:276. ♀.

*Strumigenys (Strumigenys) eggersi infuscat* Weber, 1934. Rev. de Ent. 4:35. ♀, ♀.

*Strumigenys (Strumigenys) eggersi* var. *berlesei* Weber, 1934. Rev. de Ent. 4:36. ♀.

Taxonomy: Brown, 1960 (1959). Psyche 66:37-45 (worker, female). —Brown, 1962. Psyche 69:249, 257, 264.

Biology: Weber, 1952. Amer. Mus. Novitates 1554:4-5.

### Genus SMITHISTRUMA Brown

*Cephaloxys* Smith, 1864. Linn. Soc. London, Jour. 8:77. Preocc. by Signoret, 1847.

Type-species: *Cephaloxys capitata* Smith. Monotypic.

*Smithistruma* Brown, 1948. Amer. Ent. Soc., Trans. 74:104-106.

Type-species: *Strumigenys pulchella* Emery. Orig. desig.

*Smithistruma* subg. *Wessonistruma* Brown, 1948. Amer. Ent. Soc., Trans. 74:106.

Type-species: *Strumigenys pergandei* Emery. Orig. desig.

*Smithistruma* subg. *Weberistruma* Brown, 1948. Amer. Ent. Soc., Trans. 74:106-107.

Type-species: *Strumigenys (Cephaloxys) leptothrix* Wheeler. Orig. desig.

*Smithistruma* subg. *Platystroma* Brown, 1953. Amer. Midland Nat. 50:112.

Type-species: *Strumigenys (Cephaloxys) depressiceps* Wheeler. Orig. desig.

Ants of this genus nest in small colonies in the soil, various types of soil cover, rotting logs and stumps, and beneath objects. They are most frequently collected in berlese funnels of samples of leaf litter, duff, etc. Food consists almost exclusively of Collembola.

Revision: Emery, 1895. Zool. Jahrb., Abt. f. System. 8:325-329. —Wheeler, 1908. Amer. Mus.

Nat. Hist., Bul. 24:148. —Smith, 1931. Ent. Soc. Amer., Ann. 24:691-710. —Wesson and

Wesson, 1939. Psyche 46:91-112. —Brown, 1953. Amer. Midland Nat. 50:55-92 (key to spp.).

Taxonomy: Wheeler and Wheeler, 1954. Psyche 61:141-145 (larvae).

Biology: Brown, 1950. Brooklyn Ent. Soc., Bul. 45:87-89. —Wilson, 1953. Ent. Soc. Amer., Ann. 46:485-487. —Brown and Wilson, 1960 (1959). Quart. Rev. Biol. 34:282. —Brown, 1964. Amer. Ent. Soc., Trans. 89:183-200.

**abdita** (Wesson and Wesson). Pa., Va., N. C., Ohio, Ill., Iowa. Ecology: Nests are found under rocks in the soil.

*Strumigenys (Cephaloxys) abdita* Wesson and Wesson, 1939. Psyche 46:95, 109. ♀.

Taxonomy: Brown, 1953. Amer. Midland Nat. 50:89-90 (worker, female). —Brown, 1964.

Amer. Ent. Soc., Trans. 89:189-190, 199-200.

**angulata** (Smith). Ill., Ala., Miss. Ecology: Colonies found in a rotten pine stump; some specimens found in nest of *Strumigenys louisianae* Roger.

*Strumigenys (Cephaloxys) angulata* Smith, 1931. Ent. Soc. Amer., Ann. 24:691, 697. ♀.

Taxonomy: Smith, 1932. Ent. News 43:157-158 (also biology). —Wesson and Wesson, 1939.

Psyche 46:110. —Brown, 1953. Amer. Midland Nat. 50:54-55 (worker, female).

**bimarginata** (Wesson and Wesson). Ohio, Ill. Ecology: Specimens found in soil cover.

*Strumigenys (Cephaloxys) bimarginata* Wesson and Wesson, 1939. Psyche 46:95-97. ♀.

Taxonomy: Brown, 1953. Amer. Midland Nat. 50:62-63 (worker, female).

**bunki** Brown. Ga., Fla., Miss., La. Ecology: Nests are found in the soil.

*Smithistruma (Smithistruma) bunki* Brown, 1950. Amer. Ent. Soc., Trans. 76:41-42. ♀.

Taxonomy: Brown, 1953. Amer. Midland Nat. 50:82-84 (worker, female). —Brown, 1964.

Amer. Ent. Soc., Trans. 89:190.

**californica** Brown. Calif.

*Smithistruma (Smithistruma) californica* Brown, 1950. Amer. Ent. Soc., Trans. 76:40-41. ♀.

Taxonomy: Brown, 1953. Amer. Midland Nat. 50:85-86.

**carolinensis** Brown. N. C., S. C. Ecology: Specimens found in pine needle litter and oak leaf mold.

*Smithistruma carolinensis* Brown, 1964. Amer. Ent. Soc., Trans. 89:185-186. ♀.

**cloydi** Pfitzer. Tenn. (Knoxville).

*Smithistruma cloydi* Pfitzer, 1951. Tenn. Acad. Sci., Jour. 16:198-200. ♀.

Taxonomy: Brown, 1964. Amer. Ent. Soc., Trans. 89:191.

**clypeata** (Roger). N. J., Pa. s. to Fla., w. to Ill., Ark., La. Ecology: Usually found in forested areas where it nests in soil cover, under stones, and in rotten logs.

*Strumigenys clypeata* (!) Roger, 1863. Berlin. Ent. Ztschr. 7:213. ♀.

Taxonomy: Mayr, 1887. Zool.-Bot. Gesell. Wien, Verh. 37:571 (worker, female). —Emery, 1895. Zool. Jahrb., Abt. f. System. 8:326, 328 (each caste). —Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:148. —Smith, 1931. Ent. Soc. Amer., Ann. 24:691, 699-700. —Brown, 1953. Amer. Midland Nat. 50:58-59 (each caste). —Wheeler and Wheeler, 1954. Psyche 61:143 (larva). —Brown, 1964. Amer. Ent. Soc., Trans. 89:191 (further distribution).

Biology: Smith, 1932. Ent. News 43:159. —Dennis, 1938. Ent. Soc. Amer., Ann. 31:291, 305. —Wesson and Wesson, 1939. Psyche 46:93-94. —Smith, 1955. Brooklyn Ent. Soc., Bul. 50:28. —Wilson, 1953. Ent. Soc. Amer., Ann. 46:486.

**creightoni** (Smith). D. C., N. C., Ga., Fla., Tenn., Ala. Ecology: Collections made from leaf litter.

*Strumigenys (Cephaloxys) creightoni* Smith, 1931. Ent. Soc. Amer., Ann. 24:692, 705. ♀.

Taxonomy: Wesson and Wesson, 1939. Psyche 46:110. —Brown, 1953. Amer. Midland Nat. 50:80-81 (worker, female). —Brown, 1964. Amer. Ent. Soc., Trans. 89:191.

**dietrichi** (Smith). Md. s. to Fla., w. to Ohio, Ill., Ark., La. Ecology: Nests in or under bark of rotting logs or stumps; a few are known from leaf litter. Sometimes occurs in or near nests of other ants.

*Strumigenys (Cephaloxys) dietrichi* Smith, 1931. Ent. Soc. Amer., Ann. 24:691, 696. ♀.

Taxonomy: Smith, 1932. Ent. News 43:159. —Wesson and Wesson, 1939. Psyche 46:108. —Brown, 1953. Amer. Midland Nat. 50:67-68 (worker, female). —Wheeler and Wheeler, 1954. Psyche 61:143 (larva). —Brown, 1964. Amer. Ent. Soc., Trans. 89:191-192.

Biology: Kennedy and Schramm, 1933. Ent. Soc. Amer., Ann. 26:95-96. —Dennis, 1938. Ent. Soc. Amer., Ann. 31:270, 272-273, 291, 305. —Wilson, 1953. Ent. Soc. Amer., Ann. 46:487.

**filirrhina** Brown. N. C., Mo. Ecology: Specimens taken in leaf mold.

*Smithistruma (Smithistruma) filirrhina* Brown, 1950. Amer. Ent. Soc., Trans. 76:37-38. ♀.

Taxonomy: Brown, 1953. Amer. Midland Nat. 50:63-64. —Brown, 1964. Amer. Ent. Soc., Trans. 89:193.

**filitalpa** Brown. Ind., Ark.

*Smithistruma (Smithistruma) filitalpa* Brown, 1950. Amer. Ent. Soc., Trans. 76:39-40. ♀.

Taxonomy: Brown, 1953. Amer. Midland Nat. 50:79-80. —Brown, 1964. Amer. Ent. Soc., Trans. 89:193-194.

**laevinasis** (Smith). Va., N. C., Tenn., Ala., Miss., Ill. Ecology: Nests have been found in rotten logs.

*Strumigenys (Cephaloxys) clypeata* var. *laevinasis* Smith, 1931. Ent. Soc. Amer., Ann. 24:691, 701. ♀.

Taxonomy: Wesson and Wesson, 1939. Psyche 46:109. —Brown, 1953. Amer. Midland Nat. 50:61-62 (worker, female). —Brown, 1964. Amer. Ent. Soc., Trans. 89:194, 199.

Biology: Smith, 1932. Ent. News 43:159.

**margaritae** (Forel). Ga., Ala., Tex.; W. Indies, Mexico, Colombia. Ecology: Specimens have been found in soil cover.

*Strumigenys margaritae* Forel, 1893. London Ent. Soc., Trans. p. 378. ♀, ♀, ♂.

Taxonomy: Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:148. —Smith, 1931. Ent. Soc. Amer., Ann. 24:691, 692-693. —Wesson and Wesson, 1939. Psyche 46:108. —Brown, 1953. Amer. Midland Nat. 50:108-110. —Brown, 1964. Amer. Ent. Soc., Trans. 89:194-195.

**missouriensis** (Smith). N. Y., Va., N. C., Ohio, Miss., Ill., Iowa, Mo. Ecology: Primarily a soil and soil cover inhabitant.

*Strumigenys (Cephaloxys) missouriensis* Smith, 1931. Ent. Soc. Amer., Ann. 24:691, 701. ♀.

*Strumigenys (Cephaloxys) sculpturata* Smith, 1931. Ent. Soc. Amer., Ann. 24:692, 706. ♀.

Taxonomy: Brown, 1953. Amer. Midland Nat. 50:72-73 (worker, female). —Wheeler and Wheeler, 1954. Psyche 61:143 (larva). —Brown, 1964. Amer. Ent. Soc., Trans. 89:195.

Biology: Wilson, 1953. Ent. Soc. Amer., Ann. 46:485-486.

**ohioensis** (Kennedy and Schramm). N. J. s. to Ga., w. to Ill., Ark., La. Ecology: Found in soil cover and upper soil layers, often under objects; sometimes in rotting wood.

*Strumigenys ohioensis* Kennedy and Schramm, 1933. Ent. Soc. Amer., Ann. 26:98-99. ♀.

*Strumigenys (Cephaloxys) manni* Wesson and Wesson, 1939. Psyche 46:97. ♀.

Taxonomy: Brown, 1953. Amer. Midland Nat. 50:87-89 (each caste). —Brown, 1964. Amer. Ent. Soc., Trans. 89:196.

**ornata** (Mayr). Del., Md. s. to Fla., w. to Mich., Ill., Mo., Okla., Tex. Ecology: Most commonly found in leaf litter or forest debris.

*Strumigenys ornata* Mayr, 1887. Zool.-Bot. Gesell. Wien, Verh. 37:571. ♀.

Taxonomy: Emery, 1895. Zool. Jahrb., Abt. f. System. 8:325, 328. —Wheeler, 1908. Amer.

Mus. Nat. Hist., Bul. 24:148 (worker, female). —Smith, 1931. Ent. Soc. Amer., Ann. 24:691, 695-696. —Wesson and Wesson, 1939. Psyche 46:109. —Brown, 1953. Amer. Midland Nat. 50:65-67. —Brown, 1964. Amer. Ent. Soc., Trans. 89:197.

**pergandei** (Emery). Mass., N. Y., Ont. s. to N. C., Tenn., w. to Iowa, Mo., Kans. Ecology: Nests in rotten logs, in soil, or under stones in soil. Often found in or near nests of other ants where it may prey on myrmecophilous collembolans. Records from Mass. are the northernmost for dacetine ants in the New World.

*Strumigenys pergandei* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:325. ♀, ♀, ♂.

Taxonomy: Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:148. —Smith, 1931. Ent. Soc. Amer., Ann. 24:691, 698-699 (also biology). —Wesson and Wesson, 1939. Psyche 46:110. —Brown, 1953. Amer. Midland Nat. 50:51-54. —Wheeler and Wheeler, 1954. Psyche 61:144-145 (larva). —Brown, 1964. Amer. Ent. Soc., Trans. 89:197.

Biology: Kennedy and Schramm, 1933. Ent. Soc. Amer., Ann. 26:95-98. —Wesson, 1936. Ent. News 47:171-174. —Brown, 1952. Psyche 59:12. —Wilson, 1953. Ent. Soc. Amer., Ann. 46:487-488.

**pilinasia** (Forel). Pa. s. to N. C., Ala., w. to Ohio, Ill., Mo., Ark., La. Ecology: Nests under stones, in soil cover, or in logs.

*Strumigenys clypeata* var. *pilinasia* Forel, 1901. Soc. Ent. de Belg., Ann. 45:339. ♀.

*Strumigenys (Cephaloxys) clypeata* var. *brevisetosa* Smith, 1935. Ent. Soc. Amer., Ann. 28:215. ♀.

*Strumigenys (Cephaloxys) medialis* Wesson and Wesson, 1939. Psyche 46:94, 110. ♀.

Taxonomy: Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:148 (worker, female). —Smith, 1931. Ent. Soc. Amer., Ann. 24:691, 700. —Wesson and Wesson, 1939. Psyche 46:109. —Brown, 1953. Amer. Midland Nat. 50:60-61 (worker, female). —Wheeler and Wheeler, 1954. Psyche 61:143 (larva). —Brown, 1964. Amer. Ent. Soc., Trans. 89:197-199.

Biology: Wilson, 1953. Ent. Soc. Amer., Ann. 46:485.

**pulchella** (Emery). N. Y., Pa. s. to Fla., w. to Ill., La. Ecology: Nests in rotting wood.

*Strumigenys pulchella* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:325, 327. ♀.

Taxonomy: Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:148 (worker, female). —Smith, 1931. Ent. Soc. Amer., Ann. 24:691, 702. —Brown, 1953. Amer. Midland Nat. 50:70-72 (each caste). —Brown, 1964. Amer. Ent. Soc., Trans. 89:198.

Biology: Dennis, 1938. Ent. Soc. Amer., Ann. 31:291, 305. —Wesson and Wesson, 1939. Psyche 46:111.

- reflexa** (Wesson and Wesson). Md. s. to N. C., Tenn., Ala., w. to Ohio, Ill. Ecology: Nests in soil or under or in objects lying on soil.  
*Strumigenys (Cephaloxys) reflexa* Wesson and Wesson, 1939. Psyche 46:102, 111. ♀.  
 Taxonomy: Brown, 1953. Amer. Midland Nat. 50:73-75 (each caste).
- rohweri** (Smith). Miss.  
*Strumigenys (Cephaloxys) rohweri* Smith, 1935. Ent. Soc. Amer., Ann. 28:214. ♀.  
 Taxonomy: Wesson and Wesson, 1939. Psyche 46:109. —Brown, 1953. Amer. Midland Nat. 50:57-58.
- rostrata** (Emery). N. J., Pa. s. to Fla., w. to Ill., Mo., La. Ecology: Nests in soil and rotting wood.  
*Strumigenys rostrata* Emery, 1895. Zool. Jahrb., Abt. f. System. 8:326, 329. ♀, ♀, ♂.  
 Taxonomy: Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:148. —Smith, 1931. Ent. Soc. Amer., Ann. 24:692, 704-705. —Wesson and Wesson, 1939. Psyche 46:110. —Brown, 1953. Amer. Midland Nat. 50:84-85 (each caste). —Wheeler and Wheeler, 1954. Psyche 61:144 (larva).  
 Biology: Dennis, 1938. Ent. Soc. Amer., Ann. 31:273, 291-292, 305. —Wilson, 1953. Ent. Soc. Amer., Ann. 46:485.
- talpa** (Weber). N. C., Fla., Ohio, Tenn., Ala., Ill., La. Ecology: Found in soil or humus.  
*Strumigenys (Cephaloxys) talpa* Weber, 1934. Psyche 41:63. ♀.  
*Strumigenys (Cephaloxys) venatrix* Wesson and Wesson, 1939. Psyche 46:103, 110. ♀.  
 Taxonomy: Brown, 1953. Amer. Midland Nat. 50:76-78 (each caste). —Wheeler and Wheeler, 1954. Psyche 61:141 (larva).  
 Biology: Wilson, 1953. Ent. Soc. Amer., Ann. 46:486.
- wrayi** Brown. N. C. (Fayetteville). Ecology: Found in leaf mold.  
*Smithistruma (Smithistruma) wrayi* Brown, 1950. Amer. Ent. Soc., Trans. 76:38-39. ♀.  
 Taxonomy: Brown, 1953. Amer. Midland Nat. 50:78-79.

#### Genus TRICHOSCAPA Emery

*Strumigenys* subg. *Trichoscapa* Emery, 1869. Accad. Degli Aspiranti Napoli, Ann. 2:24.  
 Type-species: *Strumigenys (Trichoscapa) membranifera* Emery. Monotypic.

The single species in this genus has been spread throughout the tropical regions of the world by commerce.

Revision: Brown, 1948. Amer. Ent. Soc., Trans. 74:112-114.

Taxonomy: Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:144-145, 148. —Smith, 1931. Ent. Soc. Amer., Ann. 24:691, 693-695.

Biology: Brown and Wilson, 1960 (1959). Quart. Rev. Biol. 34:283.

- membranifera** (Emery). Ga., Fla., Ala., Miss., La., Calif. (nr. Stockton); Pantropical. Ecology: Nests are in soil, wood, and plant cavities, and the ants are predaceous on a variety of small soft-bodied arthropods. Introduced, probably of African origin.  
*Strumigenys (Trichoscapa) membranifera* Emery, 1869. Accad. Degli Aspiranti Napoli, Ann. 2:24. ♀.  
*Strumigenys membranifera simillima* Emery, 1890. Soc. Ent. Ital., Bol. 22:69. ♀.  
*Strumigenys membranifera* var. *santschii* Forel, 1904. Rev. Suisse de Zool. 12:6. ♀.  
*Strumigenys (Cephaloxys) vitiensis* Mann, 1921. Harvard Univ., Mus. Comp. Zool., Bul. 64:461-462. ♀.  
*Strumigenys (Cephaloxys) silvestriana* Wheeler, 1928. Bol. Lab. Zool. Sci. Agr. Portici 22:27-28. ♀.  
*Strumigenys (Cephaloxys) fochowensis* Wheeler, 1928. Bol. Lab. Zool. Sci. Agr. Portici 22:28-29. ♀.  
*Strumigenys (Cephaloxys) membranifera* var. *marioni* Wheeler, 1933. Hawaii. Ent. Soc., Proc. 8:276. ♀.

*Strumigenys (Cephaloxys) membranifera* var. *williamsi* Wheeler, 1933. Hawaii. Ent. Soc., Proc. 8:275-277. ♀, ♀.

Taxonomy: Smith, 1936. Puerto Rico Univ., Jour. Agr. 20:829, 856. —Brown, 1948. Amer. Ent. Soc., Trans. 74:114. —Brown, 1949. Mushi 20:7, 22. —Wheeler and Wheeler, 1954. Psyche 61:145 (larva). —Wilson and Taylor, 1967. Pacific Ins. Monog. 14:35 (Polynesia).

Biology: Weber, 1952. Amer. Mus. Novitates 1554:7. —Wilson, 1953. Ent. Soc. Amer., Ann. 46:483-485. —Brown, 1954. Harvard Univ., Mus. Comp. Zool., Bul. 112:6.

### Genus QUADRISTRUMA Brown

*Quadristruma* Brown, 1949. Amer. Ent. Soc., Trans. 75:47.

Type-species: *Epitritus emmae* Emery. Orig. desig.

The single species in the United States is an introduction.

**emmae** (Emery). Fla. (homestead); Pantropical. Ecology: Most commonly found under objects on sea beaches or in debris from forests or agricultural areas near the sea. Introduced; spread to many tropical regions of the world by commerce, possibly originating from Africa.

*Epitritus emmae* Emery, 1890. Soc. Ent. Ital., Bol. 22:70. ♀.

*Epitritus clypeatus* Szabo, 1909. Arch. Zool. (Budapest) 1(7):1. ♀.

*Epitritus clypeatus* var. *malesiana* Forel, 1913. Zool. Jahrb., Abt. f. System. 36:83-84. ♀.

*Epitritus wheeleri* Donisthorpe, 1916. Ent. Rec. 28:121. ♀.

Taxonomy: Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24:149. —Smith, 1936. Puerto Rico Univ., Jour. Agr. 20:829, 858. —Brown, 1949. Amer. Ent. Soc., Trans. 75:48-50 (worker, female). —Wilson and Taylor, 1967. Pacific Ins. Monog. 14:42 (Polynesia).

Biology: Weber, 1934. Rev. de Ent. 4:51. —Brown, 1949. Mushi 20:21. —Brown, 1954. Harvard Univ., Mus. Comp. Zool., Bul. 112:6. —Brown and Wilson, 1960 (1959). Quart. Rev. Biol. 34:281. —Kempf, 1961. Studia Ent. 4:516.

### TRIBE BASICEROTINI

Revision: Brown and Kempf, 1960. Studia Ent. 3:161-250 (world). —Taylor, 1968. Austral. Jour. Zool. 16:333-348 (Indo-Australian).

Taxonomy: Wheeler and Wheeler, 1954. Psyche 61:111-145 (larvae).

### Genus EURHOPALOTHRIX Brown and Kempf

*Eurhopalothrix* Brown and Kempf, 1960. Studia Ent. (n. s.) 3:202-203.

Type-species: *Rhopalothrix Bolaui* Mayr. Desig. by Brown and Kempf, 1961.

Taxonomy: Brown and Kempf, 1961 (1960). Psyche 67:44. —Wheeler and Wheeler, 1973. Pan-Pacific Ent. 49:207 (larvae).

**floridana** Brown and Kempf. Fla. (Highlands Hammock, Highlands Co.). Ecology: Collected in leaf litter.

*Eurhopalothrix floridana* Brown and Kempf, 1960. Studia Ent. (n. s.) 3:207-208. ♀.

### TRIBE ATTINI

Taxonomy: Wheeler, 1948. Amer. Midland Nat. 40:664-689 (larvae). —Weber, 1970. Ent. Soc. Wash., Proc. 72:414-415 (northern extent of tribe). —Wheeler and Wheeler, 1974. Ent. Soc. Wash., Proc. 76:76-81 (larvae).

Biology: Weber, 1962. Amer. Mus. Nat. Hist., Bul. 71:45-49 (insect gardeners). —Weber, 1966. Science 153:587-604 (general). —Moser, 1967. Amer. Mus. Nat. Hist., Nat. Hist. 76:32-35 (trail of the leafcutters). —Weber, 1972. Amer. Scientist 60:448-456 (general). —Weber, 1972. Amer. Phil. Soc., Mem. 92, 146 pp. (gardening ants, the attines).

Morphology: Blum, Moser, and Cordero, 1964. *Psyche* 71:1-7 (source and specificity of odor trail substances). — Moser, 1964. *Science* 143:1048-1049 (inquiline roach responds to trail making substance). — Markl, 1970. *Z. Vergl. Physiol.* 69:2-37 (communication by stridulatory signals). — Crewe and Blum, 1972. *Jour. Ins. Physiol.* 18:31-42 (alarm pheromones, their phylogenetic significance).

#### Genus CYPHOMYRMEX Mayr

*Cyphomyrmex* Mayr, 1862. *Zool.-Bot. Gesell. Wien, Verh.* 12:690.

Type-species: *Cyphomyrmex minutus* Mayr. Monotypic.

*Cyphomyrmex* subg. *Cyphomannia* Weber, 1938. *Rev. de Ent.* 9:183.

Type-species: *Cyphomyrmex* (*Cyphomannia*) *laevigatus* Weber. Orig. desig.

A rather large Neotropical genus with extensions into the southern United States. These ants form small colonies, usually in the soil, and live on fungi which they cultivate from a substratum of vegetable matter or feces of certain insects.

Revision: Mayr, 1887. *Zool.-Bot. Gesell. Wien, Verh.* 37:555-562. — Wheeler, 1907. *Amer. Mus. Nat. Hist.*, Bul. 23:670, 719-728, 765-773. — Weber, 1940. *Rev. de Ent.* 11:406-427. — Kempf, 1964. *Studia Ent.* 7:1-44 (*strigatus* group). — Kempf, 1965. *Studia Ent.* 8:161-200 (*rimosus* group).

Taxonomy: Wheeler, 1948. *Amer. Midland Nat.* 40:668-670 (larvae). — Weber, 1966. *Ent. News* 77:166-168.

Biology: Weber, 1955. *Science* 121:109. — Weber, 1957. *Ecology* 38: 480-494 (cultivation of fungus).

*rimosus* (Spinola). Fla., Ala., Miss., La., Tex., Ariz., Calif.; W. Indies and Mexico s. to Argentina. Ecology: Nests are in soil, under bark of rotten wood, or in humus around roots; cultures a fungus in form of a yeast. A puzzling and variable complex for which many subspecies have been proposed; see Kempf (1965) for names to be considered.

*Cryptocerus* ? *rimosus* Spinola, 1853. *Accad. Sci. Torino, Mem.* (2) 13: 65. ♀, ♂.

*Meranoplus difformis* Smith, 1858. *Cat. Hym. Brit. Mus.* v. 6, p. 195. ♀.

*Cyphomyrmex minutus* Mayr, 1862. *Zool.-Bot. Gesell. Wien, Verh.* 12:691. ♀.

*Cyphomyrmex steinheili* Forel, 1884. *Soc. Vaud. des Sci. Nat.*, Bul. 20:368. ♀.

*Cyphomyrmex rimosus* var. *comalensis* Wheeler, 1907. *Amer. Mus. Nat. Hist.*, Bul. 23:719. ♀, ♀, ♂.

Taxonomy: Wheeler, 1907. *Amer. Mus. Nat. Hist.*, Bul. 23:719-712. — Weber, 1940. *Rev. de Ent.* 11:411. — Weber, 1941. *Rev. de Ent.* 12:116-119. — Wheeler, 1948. *Amer. Midland Nat.* 40:668 (larva). — Weber, 1958. *Ent. Soc. Wash.*, Proc. 60:259-260. — Wheeler and Wheeler, 1960. *Ent. Soc. Wash.*, Proc. 62:28 (larva). — Kempf, 1965. *Studia Ent.* 8:162, 198.

Biology: Wheeler, 1905. *Amer. Mus. Nat. Hist.*, Bul. 21:106. — Weber, 1945. *Rev. de Ent.* 16:5-14. — Weber, 1947. *Bol. de Ent. Venezolana* 6:144. — Weber, 1955. *Wash. Acad. Sci.*, Jour. 45:275-281. — Weber, 1972. *Amer. Phil. Soc.*, Mem. 92, pp. 8, 26, 31-32, 34, 39-42, 51, 60, 71-72, 94-95, 98-99, 102, 105-108, 110, 117.

*wheeleri* Forel. Tex., Calif.; Mexico. Ecology: Nests in the soil beneath stones in very arid habitats.

*Cyphomyrmex wheeleri* Forel, 1900. *Schweiz. Ent. Gesell. Mitt.* 10:282. ♀, ♀.

Taxonomy: Wheeler, 1907. *Amer. Mus. Nat. Hist.*, Bul. 23:725-726 (each caste). — Weber, 1940. *Rev. de Ent.* 11:409. — Kempf, 1965. *Studia Ent.* 8:167-172.

Biology: Mallis, 1941. *South. Calif. Acad. Sci.*, Bul. 40:74. — Weber, 1972. *Amer. Phil. Soc.*, Mem. 92, pp. 26, 93. — Wheeler and Wheeler, 1973. *Ants of Deep Canyon*, pp. 97-98.

#### Genus MYCETOSORITIS Wheeler

*Atta* subg. *Mycetosoritis* Wheeler, 1907. *Amer. Mus. Nat. Hist.*, Bul. 23:714.

Type-species: *Mycetosoritis hartmanni* Wheeler. Monotypic

A small genus found only in the United States and Brazil.

Taxonomy: Creighton, 1950. Harvard Univ., Mus. Comp. Zool., Bul. 104:317-318. —Kempf, 1964. *Studia Ent.* 7:1.

**hartmanni** (Wheeler). La., Tex. Ecology: Forms small colonies in soil; food consists of a fungus grown upon a substratum composed of flower anthers.

*Atta* (*Mycetosoritis*) *hartmanni* Wheeler, 1907. Amer. Mus. Nat. Hist., Bul. 23:714. ♀, ♀, ♂.

Taxonomy: Wheeler and Wheeler, 1974. Ent. Soc. Wash., Proc. 76:77-79 (larva).

Biology: Wheeler, 1907. Amer. Mus. Nat. Hist., Bul. 23:761-765. —Wheeler, 1910. *Ants*, pp. 334-335.

### Genus TRACHYMYRMEX Forel

*Atta* subg. *Trachymyrmex* Forel, 1893. Soc. Ent. de Belg., Ann. 37:600.

Type-species: *Atta septentrionalis* McCook. Desig. by Wheeler, 1911.

A Nearctic and Neotropical genus found from New York south to Argentina, and the largest genus of attine ants. In the United States, most forms are recorded from the more humid areas, though a few occur in arid sections. Nests are in the soil. The fungi on which the ants feed is grown on a substratum of plant particles and insect excrement.

Revision: Wheeler, 1907. Amer. Mus. Nat. Hist., Bul. 23:706-714, 746-760. —Wheeler, 1911. N. Y. Ent. Soc., Jour. 19:245-255.

Taxonomy: Weber, 1945. *Rev. de Ent.* 16:44. —Wheeler, 1948. *Amer. Midland Nat.* 40:673-674 (larvae).

Biology: Weber, 1955. *Science* 121:109. —Weber, 1960. *Ent. News* 71:1-6 (comparison of worker and female behavior).

**arizonensis** (Wheeler). Ariz. (Huachuca Mtns.). Ecology: Found in arid, stony canyons, 5000 to 6000 ft.

*Atta* (*Trachymyrmex*) *arizonensis* Wheeler, 1907. Amer. Mus. Nat. Hist., Bul. 23:710. ♀, ♂.

Taxonomy: Wheeler, 1911. N. Y. Ent. Soc., Jour. 19:250 (worker).

Biology: Wheeler, 1911. *Psyche* 18:93-98. —Essig, 1926. *Ins. of West. No. Amer.*, p. 862.

—Weber, 1972. *Amer. Phil. Soc., Mem.* 92, p. 93.

**desertorum** (Wheeler). Ariz. (nr. Tucson). Ecology: Nests were found in hard, pebbly, desert soil.

*Atta* (*Trachymyrmex*) *desertorum* Wheeler, 1911. *Psyche* 18:98-100. ♀.

Taxonomy: Wheeler, 1911. N. Y. Ent. Soc., Jour. 19:249.

Biology: Wheeler, 1911. *Psyche* 18:100-101. —Essig, 1926. *Ins. of West. No. Amer.*, p. 862.

**jamaicensis** (Andre). Fla. (Dania); W. Indies. Possibly introduced.

*Atta* (*Acromyrmex*) *jamaicensis* Andre, 1893. *Rev. Ent. Caen* 12:149. ♀.

*Trachymyrmex sharpi* Forel, 1893. *Ent. Soc. London, Trans.*, p. 372. ♀.

*Atta* (*Trachymyrmex*) *maritima* Wheeler, 1905. *Amer. Mus. Nat. Hist., Bul.* 21:107. ♀.

Taxonomy: Smith, 1936. Puerto Rico Univ., Jour. Agr. 20:860. —Weber, 1967. *Ent. News* 78:107-109.

Biology: Weber, 1972. *Amer. Phil. Soc., Mem.* 92, pp. 102, 104 (fungi).

**nogalensis** Byars. Ariz. (Nogales).

*Trachymyrmex nogalensis* Byars, 1951. *Ent. Soc. Wash., Proc.* 53:109-111. ♀, ♀.

**septentrionalis** (McCook). N. Y. (L. I., Staten Is.) s. to Fla., w. to Ill., La., Tex. Ecology: Nests are in soil, usually with a small semicircular crater. Of some economic importance because of the habit of cutting leaves from domesticated plants. The New York records are the northernmost for an attine ant.

*Oecodoma virginiana* Buckley, 1867. *Ent. Soc. Phila., Proc.* 6:346. ♀. Placement of this species is questionable.

*Atta septentrionalis* McCook, 1880. *Acad. Nat. Sci. Phila., Proc.* 32:359. ♀.

*Atta* (*Trachymyrmex*) *septentrionalis* var. *obscurior* Wheeler, 1907. *Amer. Mus. Nat. Hist., Bul.* 23:706. ♀, ♀, ♂.

- Atta* (*Trachymyrmex*) *septentrionalis* var. *vertebrata* Wheeler, 1911. N. Y. Ent. Soc., Jour. 19:246, 250. ♀, ♀.
- Atta* (*Trachymyrmex*) *septentrionalis obscurior* var. *seminole* Wheeler, 1911. N. Y. Ent. Soc., Jour. 19:247, 250. ♀, ♀, ♂.
- Atta* (*Trachymyrmex*) *septentrionalis obscurior* var. *crystallina* Wheeler, 1911. N. Y. Ent. Soc., Jour. 19:247, 250. ♀, ♀.
- Atta* (*Trachymyrmex*) *septentrionalis obscurior* var. *irrorata* Wheeler, 1911. N. Y. Ent. Soc., Jour. 19:247, 250. ♀.
- Taxonomy: Forel, 1884. Soc. Vaud. des Sci. Nat., Bul. 20:91. —Smith, 1924. Ent. News 35:52. —Cole, 1940. Amer. Midland Nat. 24:59. —Wheeler, 1948. Amer. Midland Nat. 40:673 (larva). —Weber, 1958. Ent. News 69:52-53.
- Biology: Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21:374, 386-387. —Wheeler, 1907. Amer. Mus. Nat. Hist., Bul. 23:680-681, 746-753. —Wheeler, 1911. Psyche 18:95-97. —Wheeler, 1911. N. Y. Ent. Soc., Jour. 19:250-255. —Dennis, 1938. Ent. Soc. Amer., Ann. 31:273, 292, 305. —Cole, 1939. Lloydia 2:153-160. —Cole, 1951 (1950). Ent. Soc. Amer., Ann. 43:499-500. —Weber, 1956. Ecology 37:150-161. —Weber, 1966. Ent. News 77:241. —Moser, 1964. Science 143:1048-1049 (inquiline roach responds to trail-making substance). —Weber, 1972. Amer. Phil. Soc., Mem. 92, pp. 3, 13-15, 25-28, 32-33, 35-36, 40-44, 46, 51, 54-55, 62, 70, 99, 103-104, 106-107, 112, 117.
- smithi neomexicanus* Cole. N. Mex., Ariz. Ecology: Nests found in sand. *T. smithi smithi* Buren occurs in Mexico.
- Trachymyrmex smithi neomexicanus* Cole, 1952. Tenn. Acad. Sci., Jour. 27:159-162. ♀.
- Taxonomy: Cole, 1953. Tenn. Acad. Sci., Jour. 28:300-301 (female, male).
- turrifex caroli** (Wheeler). Tex. (Huntsville).
- Atta* (*Trachymyrmex*) *turrifex caroli* Wheeler, 1911. N. Y. Ent. Soc., Jour. 19:248. ♀.
- turrifex turrifex** (Wheeler). La., Tex.; Mexico. Ecology: Nests in soil.
- Atta* (*Trachymyrmex*) *turrifex* Wheeler, 1903. Psyche 10:100. ♀, ♀.
- Taxonomy: Wheeler, 1907. Amer. Mus. Nat., Hist., Bul. 23:709-710. —Wheeler, 1911. N. Y. Ent. Soc., Jour. 19:249.
- Biology: Wheeler, 1907. Amer. Mus. Nat. Hist., Bul. 23:753-759. —Wheeler, 1911. Psyche 18:95-97.

### Genus ACROMYRMEX Mayr

- Atta* subg. *Acromyrmex* Mayr, 1865. Reise d. Novara, Zool. v. 1, Hym., p. 83.
- Type-species: *Formica hystrix* Latreille. Monotypic.
- Atta* subg. *Moellerius* Forel, 1893. Soc. Ent. de Belg., Ann. 37:589.
- Type-species: *Atta* (*Acromyrmex*) *landolti* Forel. Desig. by Wheeler, 1911.
- Pseudoatta* Gallardo, 1916. Buenos Aires Mus. Nac. de Hist. Nat., An. 28:320. Syn. uncertain.
- Type-species: *Pseudoatta argentina* Gallardo. Monotypic.
- A Neotropical genus with a slight extension into southwestern United States. These are mostly grassland and semidesert fungus-growing ants which usually collect grass. They are comparable to *Atta* in biology and economic importance but colonies are apparently not so large and the leaf-cutting habits not so extensive. The species listed below have previously been placed in the subgenus *Moellerius*.
- Revision: Wheeler, 1907. Amer. Mus. Nat. Hist., Bul. 23:669-700, 703-706, 743-746. —Santschi, 1925. Rev. Suisse de Zool. 31:386-398.
- Taxonomy: Weber, 1945. Rev. de Ent. 16:61-62. —Wheeler, 1948. Amer. Midland Nat. 40:674-676 (larvae). —Brown, 1973. In Meggers, et al., Tropical Forest Ecosystems in Afr. and S. Amer., pp. 178-185 (generic syn.).
- Biology: Weber, 1967. Ent. Soc. Amer., Ann. 78:107-109 (growth of young colonies in first year).



**versicolor chisosensis** (Wheeler). Tex. (Mtns. of Big Bend area).

*Atta* (*Moellerius*) *versicolor chisosensis* Wheeler, 1907. Amer. Mus. Nat. Hist., Bul. 23:705. ♀.

**versicolor versicolor** (Pergande). Ariz., Calif.; Mexico. Ecology: Nests are in soil in deserts; collects pieces of leaves from bushes and herbs for a media on which to grow fungus.

*Atta versicolor* Pergande, 1893. Calif. Acad. Sci., Proc. 4:31. ♀.

Taxonomy: Wheeler, 1907. Amer. Mus. Nat. Hist., Bul. 23:703-705 (each caste).

Biology: Wheeler, 1907. Amer. Mus. Nat. Hist., Bul. 23:743-746. —Wheeler, 1911. Psyche 18:101. —Wheeler, 1917. Psyche 24:179-180. —Weber, 1972. Amer. Phil. Soc., Mem. 92, pp. 22, 26, 30, 32.

### Genus ATTA Fabricius

*Atta* Fabricius, 1804. Systema Piezatorum, p. 421.

Type-species: *Formica cephalotes* Linnaeus. Desig. by Wheeler, 1911.

*Oecodoma Latreille*, 1818. Nouv. Dict. Hist. Nat. 23:223.

Type-species: *Formica cephalotes* Linnaeus. Desig. by Shuckard, 1840.

*Archeatta* Gonçalves, 1942. Soc. Brasil. de Agron., Bol. 5:342.

Type-species: *Oecodoma mexicana* Smith. Orig. desig.

*Atta* subg. *Neoatta* Gonçalves, 1942. Soc. Brasil. de Agron., Bol. 5:334.

Type-species: *Formica sexdens* Linnaeus. Orig. desig.

*Atta* subg. *Palaeatta* Borgmeier, 1950. Inst. Oswaldo Cruz, Mem. 48:244, 270.

Type-species: *Atta bisphaerica* Forel. Orig. desig.

*Atta* subg. *Epiatta* Borgmeier, 1950. Inst. Oswaldo Cruz, Mem. 48:246, 272.

Type-species: *Atta laevigata* Smith. Orig. desig.

A Neotropical genus with an extension into southern United States. The nests, which are deep in the soil and usually have many lateral and vertical entrances, are often extremely large and contain numerous individuals. Workers defoliate both wild and domesticated plants, including trees, and they feed on a fungus grown from a substratum composed of macerated leaves and other vegetable matter.

Revision: Wheeler, 1907. Amer. Mus. Nat. Hist., Bul. 23:669-703, 729-742. —Gonçalves, 1942. Soc. Brasil. de Agron., Bol. 5:333-358. —Borgmeier, 1959. Studia Ent. 2:321-390.

Taxonomy: Wheeler, 1948. Amer. Midland Nat. 40:676-683 (larvae). —Borgmeier, 1950. Inst. Oswaldo Cruz, Mem. 48:239-263. —Weber, 1958. Ent. News 69:7-13. —Smith, 1963. Ent. Soc. Wash., Proc. 65:299-302 (key to spp. of U. S. and Mexico; biol. notes). —Weber, 1968. Ent. Soc. Wash., Proc. 70:348-350 (Panama species).

Biology: Weber, 1962. Amer. Mus. Nat. Hist., Nat. Hist. 61:45-51.

Morphology: Blum, *et al.*, 1968. Comp. Biochem. Physiol. 26: 291-299 (alkanones and terpenes in the mandibular glands of *Atta* species).

**mexicana** (Smith). Ariz. (Organ Pipe Cactus Natl. Mon.); Mexico s. to Honduras. Ecology:

Nests are in a variety of ecological situations and their fungus gardens are grown on a wide variety of vegetable substances.

*Oecodoma mexicana* Smith, 1858. Cat. Hym. Brit. Mus. 6:185. ♀, ♂.

Taxonomy: Wheeler, 1907. Amer. Mus. Nat. Hist., Bul. 23:702-703. —Gonçalves, 1942. Soc. Brasil. de Agron., Bol. 5:335, 337, 343. —Byars, 1949. Jour. Econ. Ent. 42:545 (Ariz. record; soldier). —Borgmeier, 1950. Inst. Oswaldo Cruz, Mem. 48:260-261. —Borgmeier, 1959. Studia Ent. 2:351-353 (each caste). —Smith, 1963. Ent. Soc. Wash., Proc. 65:299-302.

**texana** (Buckley). La., Tex.; e. Mexico. Ecology: Nests are in well-drained sand or loamy soils.

The interior of the nest may reach a depth of 15 to 20 ft. and contains innumerable interconnected chambers. It is connected to the exterior by numerous holes which are surrounded by crater-shaped piles of dirt. In a large nest there may be 1,000 entrance holes occupying an area of 4,500 square feet. The ants grow a fungus primarily on macerated leaves. An economically important pest; invades houses; cuts leaves from domesticated plants; steals seeds; builds unsightly nests; damages roads, walks, stock, or

equipment by cave-ins of the nest; and can inflict painful bites. Texas leafcutting ant; also known locally as the town ant, night ant, cut ant, parasol ant, pack ant, or fungus ant.

*Myrmica (Atta) texana* Buckley, 1860. Acad. Nat. Sci. Phila., Proc. 12:233. ♀, ♀, ♂.

Taxonomy: Wheeler, 1907. Amer. Mus. Nat. Hist., Bul. 23:700-703. —Goncalves, 1942. Soc. Brasil. de Agron., Bol. 5:335, 337, 343. —Byars, 1949. Jour. Econ. Ent. 42:545. —Borgmeier, 1950. Inst. Oswaldo Cruz, Mem. 48:260-261. —Borgmeier, 1959. Studia Ent. 2:356-358. —Smith, 1963. Ent. Soc. Wash., Proc. 65:299-301. —Wheeler and Wheeler, 1974. Ent. Soc. Wash., Proc. 76:79-81 (larva).

Biology: Wheeler, 1907. Amer. Mus. Nat. Hist., Bul. 23:729-742. —Hunter, 1912. U. S. Dept. Agr., Bur. Ent. Cir. 148:1-4. —Jones, 1917. Jour. Econ. Ent. 10:561. —Snyder, 1937. La. Conserv. Rev., pp. 14-17. —Walter, Seaton, and Mathewson, 1938. U. S. Dept. Agr. Cir. 494:1-18. —Metcalf and Flint, 1939. Destructive and Useful Insects, p. 771. —Smith, 1939. South. Forest Expt. Sta., Occas. Papers 84:2-6. —Johnston, 1944. Jour. Forestry 42:130-132. —Bennett, 1958. U. S. Dept. Agr., Forest Pest Leaflet 23:1-4 (rev. 1967). —Warter, Moser, and Blum, 1962. La. Acad. Sci., Proc. 25:42-46 (correlation between night hawk feeding and nuptial flights). —Moser, 1962. Forests and People 12:40-41 (nesting habits). —Moser, 1963. Ent. Soc. Amer., Ann. 56:286-291 (contents and structure of nest in summer). —Moser, 1964. Science 143:1048-1049 (inquiline roach responds to trail-making substance). —Moser, 1967. Insectes Sociaux 14:295-312 (mating activities). —Moser, 1967. Amer. Mus. Nat. Hist., Nat. Hist. 76:33-35. —Weber, 1972. Amer. Phil. Soc., Mem. 92, pp. 3, 24, 30-33, 35, 37-38, 65, 81, 84.

Morphology: Moser and Blum, 1963. Science 140:1228 (trail marking substance, source and potency). —Moser, Brownlee, and Silverstein, 1968. Jour. Ins. Physiol. 14:529-535 (alarm pheromones). —Hermann, Moser, and Hunt, 1970. Ent. Soc. Amer., Ann. 63:1152-1158 (poison apparatus, morphological and behavioral changes). —Moser and Silverstein, 1967. Nature 215:206-207 (volatility of trail marking substance). —Tumlinson, *et al.*, 1971. Nature 234: 348-349 (identification of trail pheromone). —Tumlinson, *et al.*, 1972. Jour. Insect. Physiol. 18: 809-814 (a volatile trail pheromone). —Riley, *et al.*, 1974. Science 183: 760-762 (biological responses to its alarm pheromone).

#### UNPLACED TAXA OF MYRMICINAE

*Pheidole buckleyi* Smith, 1951. In Muesebeck, *et al.* U. S. Dept. Agr., Agr. Monog. 2:806. N. name for *Atta pennsylvanica* Buckley.

*Crematogaster (Acrocoelia) sanguinea coachellai* Enzmann, 1946. N. Y. Ent. Soc., Jour. 54:95. ♀. In same paper, fig. 3 of the petiole is given as that of *Crematogaster (Acrocoelia) lineolata* var. *coachellai*.

*Myrmica corrugata* Say, 1836. Boston Jour. Nat. Hist. 1:291. ♀, ♂.

*Myrmica dimidiata* Say, 1836. Boston Jour. Nat. Hist. 1:293. ♀ (?). N. Amer.

*Myrmica (Monomarium (!)) diversa* Buckley, 1867. Ent. Soc. Phila., Proc. 6:337. ♀, ♀. Tex.

*Myrmica inflecta* Say, 1836. Boston Jour. Nat. Hist. 1:292. ♂.

*Myrmica (Monomarium (!)) lineolata* Buckley, 1867. Ent. Soc. Phila., Proc. 6:340. ♀, ♀. Preocc. by Say, 1836. No locality.

*Solenopsis madara* Roger, 1863. Berlin. Ent. Ztschr. 7:200. ♀, ♀.

*Myrmica (Monomarium (!)) montana* Buckley, 1867. Ent. Soc. Phila., Proc. 6:339. ♀. Tex.

*Myrmica novaeboracensis* Buckley, 1867. Ent. Soc. Phila., Proc. 6:337. ♀. N. Y.

*Myrmica opposita* Say, 1836. Boston Jour. Nat. Hist. 1:292. ♀, ♂. N. Amer.

*Atta pennsylvanica* Buckley, 1867. Ent. Soc. Phila., Proc. 6:345. ♀, ♀. Pa. Previously placed in *Pheidole* where it would be preocc. by Roger, 1863; see *Pheidole buckleyi* Smith.

*Atta picea* Buckley, 1867. Ent. Soc. Phila., Proc. 6:344. ♀, ♀. Tex.

*Oecodoma pilosa* Buckley, 1867. Ent. Soc. Phila., Proc. 6:348. ♀. Tex.

*Myrmica (Diplorhoptum) scabrata* Buckley, 1867. Ent. Soc. Phila., Proc. 6:343. ♀. Conn.

*Myrmica (Atta) sublanuginosa* Buckley, 1867. Ent. Soc. Phila., Proc. 6:343. ♀. Tex.

*Oecodoma tardigrada* Buckley, 1867. Ent. Soc. Phila., Proc. 6:349. ♀, ♀, ♂. Tex.

*Pheidole pubiventris* race *timmi* Forel, 1901. Mitt. Naturh. Mus. Hamburg 18:62. ♀, ♀.

"Probably of Mexican origin - Dr. R. Timm."

## SUBFAMILY DOLICHODERINAE

A small subfamily with most Nearctic representatives found in the southern portion of the United States. Most species are small, drab-colored insects and are recognized by the single segmented pedicel, lack of a constriction between the first and second gastric segments, and the slitlike cloacal orifice.

Taxonomy: Starcke, 1933. Tijdschr. v. Ent. 76: XXVI-XXXII (larvae). —Wheeler and Wheeler, 1951. Ent. Soc. Wash., Proc. 53: 169-210 (larvae). —Wheeler and Wheeler, 1966. Ent. Soc. Amer., Ann. 59: 726-732 (larvae). —Wheeler and Wheeler, 1974 (1973). Pan-Pacific Ent. 49: 396-401 (larvae).

Morphology: Eisner, 1957. Harvard Univ., Mus. Comp. Zool., Bul. 116: 453-464 (proventriculus; use as a generic character).

## TRIBE DOLICHODERINI

## Genus DOLICHODERUS Lund

Brown (1973) listed *Monacis* Roger, 1862, *Diabolus* Karavaiev, 1926, *Diceratoclinea* Wheeler, 1935, and *Karawajewella* Donisthorpe, 1944 as synonyms of *Dolichoderus* and *Hypoclinea* Mayr, 1855, and *Acanthoclinea* Wheeler, 1935 as provisional synonyms. Because of the doubt as to the exact status of some of the genera, subgeneric groupings are used as in some previous North American literature until the genus has been adequately studied.

Taxonomy: Brown, 1973. In Meggers, et al., Tropical Forest Ecosystems in Afr. and S. Amer., pp. 178-185 (generic syn.).

## Genus DOLICHODERUS Subgenus DOLICHODERUS Lund

*Dolichoderus* Lund, 1831. Ann. des Sci. Nat., Zool. 23: 130.

Type-species: *Formica attelaboides* Fabricius. Monotypic.

Not known to occur in the Nearctic Region.

## Genus DOLICHODERUS Subgenus HYPOCLINEA Mayr

*Hypoclinea* Mayr, 1855. Zool.-Bot. Gesell. Wien, Verh. 5: 377.

Type-species: *Formica quadripunctata* Linnaeus. Desig. by Wheeler, 1911.

In North America, this subgenus is found only in the eastern half of the continent. Colonies are small to moderately large and nests are constructed in the soil, in curled leaves and hollow stems of plants, and in cartons attached to plants. Workers attend honeydew-excreting insects and feed on small arthropods. Some forms emit a fluid which has a peculiar smoky or pungent odor.

Revision: Mayr, 1870. Zool.-Bot. Gesell. Wien, Verh. 20: 953-960. —Mayr, 1886. Zool.-Bot. Gesell. Wien, Verh. 36: 434-437. —Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21: 305-319.

Taxonomy: Brown, 1950. Wasmann Jour. Biol. 8: 249. —Wheeler and Wheeler, 1951. Ent. Soc. Wash., Proc. 53: 172 (larvae). —Wheeler and Wheeler, 1966. Ent. Soc. Amer., Ann. 59: 726-730 (larvae).

Biology: Kownoski, 1959. Insectes Sociaux 6: 129-134 (flight comparisons of some spp.). —Torossian, 1960. Insectes Sociaux 7: 383-393 (biology of *D. quadripunctatus* (L.)).

Morphology: Torossian, 1959. Insectes Sociaux 6: 369-374 (tropholactic and proctodeal exchange in *D. quadripunctatus* (L.)).

*mariae* Forel. Mass. to Ga., w. to Minn., Ill., Okla., La. Ecology: Nests of the rather large colonies are found in the soil, preferably sand, beneath tufts of grass or small bushes.

*Dolichoderus Mariae* Forel, 1884. Soc. Vaud. des Sci. Nat., Bul. 20: 349. ♀.

*Dolichoderus mariae davisi* Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21: 306, 308. ♀.

*Dolichoderus (Hypoclinea) mariae* var. *blatchleyi* Wheeler, 1917. Ind. Acad. Sci., Proc. 26: 462. ♀.

- Taxonomy: Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21: 306. —Wheeler, 1917. Conn. State Geol. and Nat. Hist. Survey Bul. 22: 589 (worker, female). —Cole, 1940. Amer. Midland Nat. 24: 60. —Wheeler and Wheeler, 1966. Ent. Soc. Amer., Ann. 59: 726 (larva).
- Biology: Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21: 316-319, 387-388. —Smith, 1924. Ent. News 35: 81. —Talbot, 1956. Psyche 63: 134-139 (flight activities). —Kannowski, 1959. Insectes Sociaux 6: 129-133.
- plagiatus** (Mayr). N. B., Ont. s. to Ga., Tenn., w. to N. Dak., Ill. Ecology: Colonies are small and nests are found in inconspicuous places such as under forest debris in the soil, in hollow stems, and in curled-up leaves.
- Hypoclinea plagiata* Mayr, 1870. Zool.-Bot. Gesell. Wien, Verh. 20: 957, 960. ♀.
- Dolichoderus borealis* Provancher, 1888. Addit. Corr. Faune Ent. Canada Hym., p. 408. ♀.
- Dolichoderus plagiatus* var. *inornatus* Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21: 306, 313. ♀.
- Taxonomy: Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21: 310 (each caste). —Wheeler, 1917. Conn. State Geol. and Nat. Hist. Survey Bul. 22: 590. —Cole, 1940. Amer. Midland Nat. 24: 60. —Gregg, 1944. Ent. Soc. Amer., Ann. 37: 467. —Wheeler and Wheeler, 1966. Ent. Soc. Amer., Ann. 59: 727 (larva). —Francoeur and Beique, 1966. Canad. Ent. 98: 142 (Provancher types).
- Biology: Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21: 306, 315-316, 388. —Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24: 621-622. —Wesson and Wesson, 1940. Amer. Midland Nat. 24: 90, 99. —Kannowski, 1959. Insectes Sociaux 6: 133. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 149-151. —Kannowski, 1967. Ent. Soc. Amer., Ann. 60: 1246-1252 (population studies).
- pustulatus** Mayr. N. S. s. to Fla., w. to Ill., Okla., Tex. Ecology: Colonies are small and nests are found under piles of detritus or in a hard, thin carton shell above ground about blades of a tuft of grass.
- Dolichoderus pustulatus* Mayr, 1886. Zool.-Bot. Gesell. Wien, Verh. 36: 435-436. ♀, ♀.
- Dolichoderus plagiatus* var. *beutenmuelleri* Wheeler, 1904. Amer. Mus. Nat. Hist., Bul. 20: 304. ♀.
- Taxonomy: Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21: 306, 313, 388. —Smith, 1924. Ent. News 35: 82. —Smith, 1931. Ent. News 42: 22. —Wheeler and Wheeler, 1966. Ent. Soc. Amer., Ann. 59: 727-728 (larva).
- Biology: Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21: 315-316, 388. —Wheeler, 1917. Ind. Acad. Sci., Proc. 26: 462. —Wheeler, 1932. N. Y. Ent. Soc., Jour. 40: 12. —Wesson and Wesson, 1940. Amer. Midland Nat. 24: 89, 99. —Kannowski, 1959. Insectes Sociaux 6: 133-134, 155. —Kannowski, 1967. Ent. Soc. Amer., Ann. 60: 1246-1252 (population studies).
- taschenbergi** (Mayr). N. S., Ont. s. to S. C., w. to Man., N. Dak., S. Dak., La. Ecology: Nests of rather large colonies are constructed in the soil in wooded areas or the edge of woods and usually have a low mound of thatch (grass, twigs, needles) over the entrance hole. Workers commonly attend honeydew-excreting insects.
- Hypoclinea Taschenbergi* Mayr, 1866. Akad. der Wiss. Wien, Math.-Nat. Kl. Sitzber. 53: 498. ♀.
- Dolichoderus taschenbergi* var. *gagates* Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21: 306, 310. ♀. Preocc. by Emery, 1890.
- Dolichoderus (Hypoclinea) taschenbergi* var. *aterrimus* Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34: 417. N. name for *gagates* Wheeler.
- Dolichoderus taschenbergi* var. *wheeleriella* Forel, 1916. Rev. Suisse de Zool. 24: 458. N. name for *gagates* Wheeler.
- Taxonomy: Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21: 306, 309-310. —Smith, 1924. Ent. News 35: 82. —Cole, 1940. Amer. Midland Nat. 24: 60. —Wheeler and Wheeler, 1966. Ent. Soc. Amer., Ann. 59: 728 (larva).
- Biology: Wheeler, 1915. Psyche 22: 306. —Smith, 1924. Ent. News 35: 81-82. —Logier, 1923. Canad. Ent. 55: 247. —Dennis, 1938. Ent. Soc. Amer., Ann. 31: 292-293. —Wesson and Wesson, 1940. Amer. Midland Nat. 24: 99. —Kannowski, 1959. Ent. Soc. Amer., Ann. 52:

- 755-760 (flight activities). —Wheeler and Wheeler, 1963. *Ants of N. Dak.*, pp. 151-154.  
 —Bradley and Hinks, 1968. *Canad. Ent.* 100: 40-50 (attending aphids on jack pine).  
 —Bradley, 1972. *Canad. Ent.* 104: 245-249 (transplanting colonies in jack pine stands in Man.).  
 —Burns, 1973. *Canad. Ent.* 105: 97-104 (foraging and tending behavior).

### TRIBE TAPINOMINI

#### Genus LIOMETOPUM Mayr

*Liometopum* Mayr, 1861. *Die Europäischen Formiciden*, pp. 25, 38.

Type-species: *Formica microcephala* Panzer. Monotypic.

A Holarctic genus found only in the western United States in the Nearctic region. The Nearctic forms nest in the soil beneath cover or under bark or in crevices in trees and the nest chambers are usually subdivided by a network of paperlike material. Colonies are often populous. Workers forage in files sometimes several hundred feet long and commonly attend coccids and aphids. They are pugnacious and eject a repellent secretion with a strong and disagreeable odor like that of butyric acid.

Revision: Wheeler, 1905. *Amer. Mus. Nat. Hist.*, Bul. 21: 321-333.

Taxonomy: Wheeler and Wheeler, 1951. *Ent. Soc. Wash.*, Proc. 53: 172, 181 (larvae).

*apiculatum* Mayr. W. Tex., Colo., N. Mex., Ariz.; Mexico. Ecology: Usually in foothill areas at elevations of 4000 to 7000 feet.

*Liometopum apiculatum* Mayr, 1870. *Zool.-Bot. Gesell. Wien*, Verh. 20: 961. ♀.

Taxonomy: Emery, 1895. *Zool. Jahrb.*, Abt. f. System. 8: 331 (female). —Wheeler, 1905. *Amer. Mus. Nat. Hist.*, Bul. 21: 322-324 (each caste). —Wheeler and Wheeler, 1951. *Ent. Soc. Wash.*, Proc. 53: 181 (larva).

Biology: Wheeler, 1905. *Amer. Mus. Nat. Hist.*, Bul. 21: 322-324. —Wheeler, 1917. *Psyche* 24: 177-178. —Gregg, 1963. *Univ. Colo. Studies, Biol. Ser.* 11, pp. 1-6. —Gregg, 1963. *Ants of Colo.*, pp. 438-441. —Van Pelt, 1971. *Ent. Soc. Amer.*, Ann. 64: 1186 (trophobiosis and feeding habits).

*occidentale luctuosum* Wheeler. Wyo., Colo., w. Tex., w. to Ariz., Calif. Ecology: At higher elevations, 4000 to 8000 feet.

*Liometopum apiculatum luctuosum* Wheeler, 1905. *Amer. Mus. Nat. Hist.*, Bul. 21: 325. ♀.

Taxonomy: Forel, 1914. *Deut. Ent. Ztschr.* 6: 619 (male). —Cole, 1942. *Amer. Midland Nat.* 28: 371.

Biology: Wheeler, 1905. *Amer. Mus. Nat. Hist.*, Bul. 21: 332. —Mallis, 1941. *South Calif. Acad. Sci.*, Bul. 40: 75. —Gregg, 1963. *Ants of Colo.*, pp. 441-443. —Cole, 1966. *Brigham Young Univ.*, Sci. Bul., Biol. Ser. 7: 18 (Nevada Test Site). —Wheeler and Wheeler, 1973. *Ants of Deep Canyon*, pp. 100-101.

*occidentale occidentale* Emery. Oreg., Calif.; Mexico. Ecology: Found at lower elevations, sea level to 4000 feet.

*Liometopum microcephalum* var. *occidentale* Emery, 1895. *Zool. Jahrb.*, Abt. f. System. 8: 330. ♀, ♀.

Taxonomy: Wheeler, 1905. *Amer. Mus. Nat. Hist.*, Bul. 21: 324-325. —Eckert and Mallis, 1937. *Calif. Agr. Expt. Sta. Cir.* 342: 8, 17.

Biology: Wheeler, 1917. *Amer. Acad. Arts and Sci.*, Proc. 52: 522. —Mallis, 1941. *South Calif. Acad. Sci.*, Bul. 40: 75. —Wheeler and Wheeler, 1973. *Ants of Deep Canyon*, p. 100.

#### Genus IRIDOMYRMEX Mayr

*Iridomyrmex* Mayr, 1862. *Zool.-Bot. Gesell. Wien*, Verh. 12: 702.

Type-species: *Formica detecta* Smith. Desig. by Bingham, 1903.

*Tapinoma* subg. *Doleromyrma* Forel, 1907. *Mus. Nat. Hungarici*, Ann. 5: 28.

Type-species: *Tapinoma (Doleromyrma) darwinianum* Forel. Monotypic.

*Anonychomyrma* Donisthorpe, 1946. *Ann. and Mag. Nat. Hist.* 13: 588. Syn. uncertain.

Type-species: *Anonychomyrma myrmex* Donisthorpe. Monotypic.

Three of the four species of this cosmopolitan genus found in North America have been introduced. Most species nest in the soil and some are found in buildings. Workers collect honeydew but are also entomophagous.

Revision: Mayr, 1870. Zool.-Bot. Gesell. Wien, Verh. 20: 953-960. —Smith, 1929. Jour. Econ. Ent. 22: 241-243.

Taxonomy: Wheeler and Wheeler, 1951. Ent. Soc. Wash., Proc. 53: 172, 184 (larvae).

—Wheeler and Wheeler, 1966. Ent. Soc. Amer., Ann. 59: 729 (larvae).

**glaber** (Mayr). Fla. (Winter Park); Australian and Oriental regions. Ecology: Florida specimens collected from a stump of queen palm, *Arecastrum romanzoffianum*. Probably introduced. These specimens are tentatively referred to *glaber* since the taxonomy of *glaber* and related species in the Old World are unstudied.

*Hypoclinea glabra* Mayr, 1862. Zool.-Bot. Gesell. Wien, Verh. 12: 705. ♀, ♂.

Taxonomy: Brown, 1958. Acta Hym. 1:40-41 (also biological notes; New Zealand; Australia).

—Wheeler and Wheeler, 1974 (1973). Pan-Pacific Ent. 49: 398 (larva, from Australian specimens).

**humilis** (Mayr). Md. to Fla. w. to Ill., Tex., Ariz., Calif.; Mexico, S. Amer.; Europe; S. Africa; Hawaii; Australia. Ecology: Nests in soil, rotting wood or debris and lives in large colonies that contain many females. Workers forage in files and tend honeydew-excreting insects though they also feed on other sweet substances. A most persistent and troublesome house-infesting ant; also known to steal seeds from seedbeds, drive poultry from their nests, kill newly hatched chickens, foster honeydew-excreting insects, disrupt bee hives, and gnaw into ripened fruits. Introduced, native to S. Amer. and spread to the U. S. and other parts of the world by commerce; probably introduced first into New Orleans on coffee ships from Brazil sometime prior to 1891. Argentine ant.

*Hypoclinea (Iridomyrmex) humilis* Mayr, 1868. Soc. Nat. Modena, Ann. 3: 164. ♀.

Taxonomy: Wheeler, 1913. In Newell and Barber, U. S. Dept. Agr. Bur. Ent. Bul. 122: 27-30

(each caste). —Smith, 1929. Jour. Econ. Ent. 22: 241. —Wheeler and Wheeler, 1951. Ent.

Soc. Wash., Proc. 53: 186 (larva). —Wheeler and Wheeler, 1966. Ent. Soc. Amer., Ann. 59: 729 (larva). —Wilson and Taylor, 1967. Pacific Ins. Monog. 14: 79-80 (Polynesia).

Biology: Newell, 1909. Jour. Econ. Ent. 2: 174-192 (life history). —Newell and Barber, 1913. U. S. Dept. Agr. Bur. Ent., Bul. 122: 1-98. —Gallardo, 1915. Buenos Aires Mus. Nac. de Hist. Nat., An. 27: 23-25. —Barber, 1920. U. S. Dept. Agr. Farmers' Bul. 1101: 1-11.

—Woglum and Borden, 1921. U. S. Dept. Agr. Bul. 965: 1-43. —Harned and Smith, 1922. Jour. Econ. Ent. 15: 261-264. —Essig, 1926. Ins. of West. N. Amer., pp. 865-866. —Smith,

1936. U. S. Dept. Agr. Cir. 387: 1-39. —Mallis, 1942. Sci. Monthly 55: 536-545 (half a century with the Argentine ant). —Flanders, 1943. Calif. Citrograph 28: 117, 128, 137

(Argentine ant versus parasites of black scale). —McCluskey, 1958. Science 128: 536-537 (daily rhythm in male Argentine ant). —Skaife, 1962. The Study of Ants, p. 12. —Pavan,

1963. Pavia Univ., Sympos. Genet. et Biol. Ital. 12: 122-131. —Haskins and Haskins, 1965. Ecology 46: 737 (extension of range in Bermuda at expense of *Pheidole megacephala* (F.)).

—Smith, 1965. U. S. Dept. Agr., Tech. Bul. 1326, pp. 52-54 (economic importance).

—Markin, 1968. Kans. Ent. Soc., Jour. 41: 511-516 (study in citrus groves in Calif.).

—Markin and McCoy, 1968. Ent. Soc. Amer., Ann. 61: 505-509 (a nematode in pharyngeal glands). —Markin, 1969. Insectes Sociaux 16: 159-190 (food distribution in laboratory colonies).

—Dechene, 1970. Wasmann Jour. Biol. 28: 175-184 (behavioral patterns).

—Fluker and Beardsley, 1970. Ent. Soc. Amer., Ann. 63: 1290-1296 (ecological notes, in Hawaii). —Markin, 1970. Jour. Econ. Ent. 63: 740-744 (foraging behavior in Calif. citrus groves).

—Markin, 1970. Insectes Sociaux 17: 127-158. —Markin, 1970. Ent. Soc. Amer., Ann. 63: 1238-1242 (seasonal life cycle in S. Calif.). —Erickson, 1971. Psyche 78: 257-266

(displacement of native ant spp. by Argentine ant).

Morphology: Pavan, 1950 (1948). 8th Internat. Cong. Ent., Proc., Stockholm, pp. 863-865

(physiology). —Pavan, 1955. Soc. Ital. di Sci. Nat. Atti 94: 379-477. —Weber, 1961. Ent. Soc. Wash., Proc. 63: 218 (use of poison). —Torossian, 1961. Insectes Sociaux 8: 189-191.

—Nachtwey, 1963. Insectes Sociaux 10: 50-53.

**iniquus nigellus** Emery. Mass., Ill., other scattered localities mostly in northeastern U. S.;

Central Amer. Ecology: Found in greenhouses in U. S. Introduced. *I. iniquus iniquus*

Mayr occurs in Central and S. Amer. and W. Indies.

*Iridomyrmex iniquus* var. *nigellus* Emery, 1890. Soc. Ent. Ital., Bol. 22: 56. ♀.

Biology: Wheeler, 1929. Psyche 36: 89-90. —Smith, 1929. Jour. Econ. Ent. 22: 241-242.

**pruinus analis** (Andre). N. Dak., Kans., Okla., Tex. w. to s. Idaho, Calif.; Mexico, Guatemala.

Ecology: Nests are in soil either under objects or in exposed situations surmounted by a craterlike mound.

*Tapinoma anale* Andre, 1893. Rev. Ent. de France 12: 148. ♀.

*Iridomyrmex pruinosus* var. *testaceus* Cole, 1936. Ent. News 47: 121. ♀, ♀.

Taxonomy: Smith, 1929. Jour. Econ. Ent. 22: 241. —Eckert and Mallis, 1937. Calif. Agr. Expt.

Sta. Cir. 342: 8. —Cole, 1942. Amer. Midland Nat. 28: 372-373 (also biological notes).

Biology: Wheeler, 1906. Amer. Mus. Nat. Hist., Bul. 22: 342. —Smith, 1924. Ent. News 35: 83.

—Dennis, 1938. Ent. Soc. Amer., Ann. 31: 294, 305. —Wheeler and Wheeler, 1963. Ants of

N. Dak., pp. 154-155. —Gregg, 1963. Ants of Colo., pp. 436-438. —Cole, 1966. Brigham

Young Univ., Sci. Bul., Biol. Ser. 7: 18 (Nevada Test Site). —Wheeler and Wheeler, 1973.

Ants of Deep Canyon, pp. 101-102.

**pruinus pruinosus** (Roger). N. Y. to Fla., w. to Wis., Ohio, Tex., N. Mex.; W. Indies.

Ecology: Nests are in exposed soil with craterlike mounds or under the cover of objects.

A house pest in the Gulf Coast states.

*Tapinoma pruinosum* Roger, 1863. Berlin Ent. Ztschr. 7: 165. ♀.

Taxonomy: Smith, 1929. Jour. Econ. Ent. 22: 241. —Cole, 1940. Amer. Midland Nat. 24: 64-65.

—Cole, 1942. Amer. Midland Nat. 28: 372. —Santschi, 1930. Soc. Roy. Ent. d'Egypte, Bul.

23: 81. —Wheeler and Wheeler, 1951. Ent. Soc. Wash., Proc. 53: 185. (larva). —Wheeler

and Wheeler, 1966. Ent. Soc. Amer., Ann. 59: 729 (larva).

Biology: Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21: 389. —Smith, 1930. Fla. Ent. 14: 5.

—Wheeler, 1911. Harvard Univ., Mus. Comp. Zool., Bul. 54: 497. —Warter, Moser, and

Blum, 1962. La. Acad. Sci., Proc. 25: 42-46 (correlation between night hawk feeding and

nuptial flights of *pruinus pruinosus*). —Smith, 1965. U. S. Dept. Agr., Tech. Bul. 1326: 54-55 (economic importance).

Morphology: Blum, Warter, Monroe, and Chidchester, 1963. Jour. Ins. Physiol. 9: 881-885

(chemical releasers of social behavior - methyl-n-amyl ketone).

### Genus FORELIUS Emery

*Forelius* Emery, 1888. Ztschr. f. Wiss. Zool. 46: 389.

Type-species: *Iridomyrmex mccooki* Forel. Monotypic.

A small New World genus.

Taxonomy: Wheeler and Wheeler, 1966. Ent. Soc. Amer., Ann. 59: 729 (larvae).

**foetidis** (Buckley). Ark., Kans., Okla., Tex., Colo. w. to Calif.; Mexico. Ecology: Nests are under objects or in exposed soil with small craters of soil. Incorrectly reported from D. C.

*Formica foetida* Buckley, 1866. Ent. Soc. Phila., Proc. 6: 167. ♀, ♀.

*Iridomyrmex McCooki* Forel, 1878. Soc. Vaud. des Sci. Nat., Bul. 15: 382.

*Forelius MacCooki* race *Andrei* Forel, 1912. Soc. Ent. de Belg., Mem. 20: 44. ♀.

Taxonomy: Forel, 1886. Soc. Ent. de Belg., Bul. (C. R.) 30: 39. —Wheeler and Wheeler, 1974 (1973). Pan-Pacific Ent. 49: 401 (larva).

Biology: Cole, 1937. Ent. News 48: 137. —Mallis, 1941. South. Calif. Acad. Sci., Bul. 48: 137.

—Lindquist, 1942. Jour. Econ. Ent. 35: 850-852. —Gregg, 1963. Ants of Colo., pp. 434-436.

—Wheeler and Wheeler, 1973. Ants of Deep Canyon, pp. 102-103.

### Genus CONOMYRMA Forel

*Conomyrma* Forel, 1913. Rev. Zool. Africaine 2: 350.

Type-species: *Prenolepis pyramica* Roger. Desig. by Santschi, 1922.

*Conomyrma* subg. *Biconomyrma* Kusnezov, 1952. Acta Zool. Lilloana (Tucuman) 10: 429-430.

Type-species: *Dorymyrmex pyramicus* var. *brunnea* Forel. Desig. by Kusnezov, 1959.

A New World genus. The Nearctic forms construct nests in the soil which are surmounted by irregular or craterlike mounds of soil. They are usually found in open sunny areas in situations where other ant species find conditions intolerable. The workers are predaceous, active and aggressive and emit a fluid with a disagreeable odor. The species below have previously been assigned to the genus *Dorymyrmex* Mayr, a genus now restricted to South America. The taxa of this genus occurring in the Gulf coast states are not yet clearly understood.

Taxonomy: Gallardo, 1916. Buenos Aires Mus. Nac. de Hist. Nat., An. 28: 1-130. —Santschi, 1922. Soc. Vaud. des Sci. Nat., Bul. 54: 365. —Kusnezov, 1952. Acta Zool. Lilloana (Tucuman) 10: 427, 429, 433-438. —Wheeler and Wheeler, 1951. Ent. Soc. Wash., Proc. 53: 183. —Kusnezov, 1959. Zool. Anz. 162: 38-51. —Snelling, 1973. Los Angeles Co. Mus., Contrib. Sci. 238: 1-6 (in the U. S.).

**bicolor** (Wheeler). Tex., N. Mex., Utah, Ariz., Nev., Calif.; Mexico. Ecology: Nests are in exposed situations in the soil and are usually surmounted by irregular or craterlike mounds.

*Dorymyrmex pyramicus* var. *bicolor* Wheeler, 1906. Amer. Mus. Nat. Hist., Bul. 22: 342. ♂, ♀.

Taxonomy: Cole, 1942. Amer. Midland Nat. 28: 372. —Cole, 1957. N. Y. Ent. Soc., Jour. 65: 130. —Wilson, 1957. Psyche 64: 76.

Biology: Mallis, 1941. South. Calif. Acad. Sci., Bul. 40: 76. —Eckert and Mallis, 1937. Calif. Agr. Expt. Sta. Cir. 342: 19. —Cole, 1966. Brigham Young Univ., Sci. Bul., Biol. Ser. 7: 18 (Nevada Test Site). —Wheeler and Wheeler, 1973. Ants of Deep Canyon, pp. 103-104.

**flavopecta** (Smith). Fla. Occurrence in other Gulf Coast states is not certain.

*Dorymyrmex pyramicus flavopectus* Smith, 1944. Fla. Ent. 27: 15. ♀.

**insana** (Buckley). N. C. to Fla., w. to Ill., N. Dak., Oreg., Calif.; Mexico; W. Indies. Ecology:

Nests are in soil in open sunny places and are surmounted by an irregular or craterlike mound. A pest species mainly in the South where it commonly enters houses and builds ugly mounds on lawns. Pyramid ant. Records in the literature for *Dorymyrmex pyramicus* (Roger) in N. Amer. should refer to this species; *Conomyrma pyramica* (Roger) is a valid species but is found only in S. Amer.

*Formica insana* Buckley, 1866. Ent. Soc. Phila., Proc. 6: 165. ♂, ♀.

*Dorymyrmex flavus* McCook, 1879. In Comstock, Rpt. on Cotton Insects, p. 186. ♀.

*Dorymyrmex pyramicus* var. *nigra* Pergande, 1895. Calif. Acad. Sci., Proc. 5: 871. ♀.

*Dorymyrmex pyramica brunnea* var. *antillana* Forel, 1911. Deut. Ent. Ztschr., p. 306.

*Dorymyrmex pyramicus* var. *smithi* Cole, 1936. Ent. News 47: 120. ♀.

*Conomyrma* (?*Biconomyrma*) *wheeleri* Kusnezov, 1952. Acta Zool. Lilloana (Tucuman) 10: 438. ♀.

Taxonomy: Emery, 1895. Zool. Jahrb., Abt. f. System 8: 331-332 (male). —Cole, 1940. Amer. Midland Nat. 24: 61. —Cole, 1942. Amer. Midland Nat. 28: 371. —Smith, 1936. Puerto Rico Univ., Jour. Agr. 20: 861, 864. —Buren, 1944. Iowa State Col., Jour. Sci. 18: 291. —Wheeler and Wheeler, 1951. Ent. Soc. Wash., Proc. 53: 183 (larva). —Wilson, 1967. Psyche 64: 76 (sympatry of *bicolor* and *pyramica*). —Snelling, 1973. Los Angeles Co. Mus., Contrib. Sci. 238: 5 (syn.).

Biology: Wheeler, 1910. Ants, pp. 146, 210, 205, 426. —Smith, 1924. Ent. News 35: 82.

—Dennis, 1938. Ent. Soc. Amer., Ann. 31: 293, 305. —Eckert and Mallis, 1937. Calif. Agr. Expt. Sta. Cir. 342: 19. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 155-157.

—Gregg, 1963. Ants of Colo., pp. 432-434. —Wilson, 1967. Psyche 64: 76. —Smith, 1965. U. S. Dept. Agr., Tech. Bul. 1326: 56-57 (economic importance). —Cole, 1966. Brigham Young Univ., Sci. Bul., Biol. Ser. 7: 18 (Nevada Test Site). —Wheeler and Wheeler, 1973. Ants of Deep Canyon, pp. 105-106.

Morphology: Metcalf and Metcalf, 1970. Ent. Soc. Amer., Ann. 63: 34-35 (effects of isomers of 2-heptanone on alarm behavior). —Blum and Warter, 1966. Ent. Soc. Amer., Ann. 59: 774-779 (alarm and digging behavior; isolation of 2-heptanone).



## Genus TAPINOMA Foerster

*Tapinoma* Foerster, 1850. Hym. Stud. 1: 43.

Type-species: *Tapinoma collina* Foerster. Monotypic.

*Micromyrma* Dufour, 1857. Soc. Ent. de France, Ann. 5: 60.

Type-species: *Micromyrma pygmaea* Dufour. Monotypic.

*Tapinoma* subg. *Tapinoptera* Santschi, 1925. Eos 1: 348.

Type-species: *Tapinoma vexatum* Santschi. Monotypic.

At least one of the three North American species is introduced. Nests are found in a variety of situations and workers commonly attend honeydew-excreting insects. All of the species emit a substance with an odor similar to that of butyric acid.

Taxonomy: Wheeler and Wheeler, 1951. Ent. Soc. Wash., Proc. 53: 172 (larvae).

Morphology: Torossian, 1960. Insectes Sociaux 7: 171-174 (physiology of the Palearctic

*Tapinoma erraticum* (Latreille)). —Weber, 1961. Ent. Soc. Wash., Proc. 63: 217-218 (use of poison).

**litorale** Wheeler. S. Fla.; W. Indies. Ecology: Apparently arboreal, nesting in twigs of trees and bushes, hollow culms, or between leaves.

*Tapinoma litorale* Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21: 109. ♀, ♀, ♂.

Taxonomy: Smith, 1936. Puerto Rico Univ., Jour. Agr. 20: 861-862.

Biology: Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24: 150. —Wheeler, 1932. N. Y. Ent. Soc., Jour. 40: 13.

**melanocephalum** (Fabricius). Fla., where it is established; occasionally found in greenhouses or heated buildings in other parts of the continent such as Ont., Iowa, N. Mex., Calif.; tropicopolitan. Ecology: Highly adaptable in nesting habits; found in soil, rotten wood, decayed parts of trees, under bark, in plant cavities, houses, and greenhouses. Workers are fond of honeydew but also feed on live and dead insects. A house-infesting ant.

Introduced; widely distributed in the tropical regions of the world by commerce.

*Formica melanocephala* Fabricius, 1793. Ent. System. 2: 353. ♀.

*Formica nana* Jerdon, 1851. Madras Jour. Lit. Sci. 17: 125. ♀.

*Myrmica pellucida* Smith, 1857. Linn. Soc. London, Jour., Zool. 2: 71. ♀.

*Formica familiaris* Smith, 1860. Linn. Soc. London, Jour., Zool., Sup. 4: 96. ♀.

*Tapinoma* (*Micromyrma*) *melanocephalum* var. *australis* Santschi, 1928. Insects of Samoa 5: 53. ♀.

Taxonomy: Smith, 1928. Ent. Soc. Amer., Ann. 21: 311. —Smith, 1936. Puerto Rico Univ., Jour. Agr. 20: 861-862. —Wheeler and Wheeler, 1951. Ent. Soc. Wash., Proc. 53: 197 (larva). —Wilson and Taylor, 1967. Pacific Ins. Monog. 14: 79-82 (Polynesia).

Biology: Wheeler, 1910. Ants, pp. 154, 156. —Marlatt, 1928. U. S. Dept. Agr. Farmers' Bul. 740: 6. —Phillips, 1934. Hawaii Univ., Expt. Sta. Pineapple Prod. Coop. Assoc., Bul. 15: 20-21. —King, 1948. Iowa Acad. Sci., Proc. 55: 395. —Kempf, 1961. Studia Ent. 4: 520. —Brown, 1964. Ent. News 75: 14-15. —Smith, 1965. U. S. Dept. Agr., Tech. Bul. 1326: 59-60 (economic importance). —Tamsitt and Fox, 1966. Ent. Soc. Wash., Proc. 68: 268 (attacking lab. flea colony). —Gomez-Nunez, 1971. Jour. Med. Ent. 8: 735-737 (an inhibitor of *Rhodinus prolixus* populations).

Morphology: Weber, 1961. Ent. Soc. Wash., Proc. 63: 218 (employment of venom).

**sessile** (Say). N. S., Que. s. to Fla., w. to Wash., Calif.; Mexico. Ecology: A very adaptable ant found in a wide variety of habitats. Most nests are in the soil beneath objects but also under bark, in stumps, plant cavities, insect galls, refuse piles, and bird and mammal nests. Colonies may contain thousands of individuals and numerous reproductive females. A common and troublesome house-infesting ant. Food consists mainly of honeydew and workers attend honeydew-excreting insects. Odorous house ant.

*Formica sessilis* Say, 1836. Boston Jour. Nat. Hist. 1: 287. ♀, ♀.

*Tapinoma boreale* Roger, 1863. Berlin. Ent. Ztschr. 7: 165. ♀, ♀.

*Formica gracilis* Buckley, 1866. Ent. Soc. Phila., Proc. 6: 158. ♀, ♀.

*Formica parva* Buckley, 1866. Ent. Soc. Phila., Proc. 6: 159. ♀.

*Tapinoma boreale* Provancher, 1887. Addit. Corr. Faune Ent. Canada Hym., p. 238. ♂, ♀. Preocc. by Roger, 1863.

Taxonomy: Wheeler and Wheeler, 1951. Ent. Soc. Wash., Proc. 53: 196 (larva). —Francoeur and Beique, 1966. Canad. Ent. 98: 143 (Provancher types).

Biology: Smith, 1928. Ent. Soc. Amer., Ann. 21: 307-329. —Metcalf and Flint, 1939. Destructive and Useful Insects, Ed. 2: 770. —Weber, 1941. Canad. Ent. 73: 140-141. —Kannowski, 1959. Insectes Sociaux 6: 126-129. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 157-160. —Gregg, 1963. Ants of Colo., pp. 443-447. —Judd, 1964. Canad. Ent. 96: 990 (in galls on goldenrod). —Smith, 1965. U. S. Dept. Agr., Tech. Bul. 1326: 57-59 (economic importance). —Bobb, 1965. Jour. Econ. Ent. 58: 925 (as predator of *Neodiprion pratti pratti* (Dyar)). —Kulman, 1965. Jour. Econ. Ent. 58: 70 (as predator of *Malacosoma americanum* (F.)). —Wang and Brook, 1970. Jour. Econ. Ent. 63: 1971-1973 (toxicological and biological studies). —Wheeler and Wheeler, 1973. Ants of Deep Canyon, pp. 106-107.

Morphology: Crozier, 1970. Canad. Jour. Genet. and Cytol. 12: 541-546 (pericentric rearrangement polymorphism).

#### UNPLACED TAXA OF DOLICHODERINAE

*Bothriomyrmex dimmocki* Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34: 417. ♂, ♀. Mass. (Mt. Tom, Springfield).

*Formica masonia* Buckley, 1866. Ent. Soc. Phila., Proc. 6: 165. ♀. Tex. (Fort Mason).

*Formica (Hypochira (!) subspinosa* Buckley, 1866. Ent. Soc. Phila., Proc. 6: 169. ♀. Tex.

#### SUBFAMILY FORMICINAE

This subfamily is the predominant group of ants in North America, most common in the north and in the mountains with their numbers decreasing rapidly toward the southern part of the United States. They are recognized by the single segmented pedicel, lack of a constriction between the first and second gastric segments, and the round acidopore, usually with a circle of hairs.

Taxonomy: Wheeler and Wheeler, 1953. Ent. Soc. Amer., Ann. 46: 126-171, 175-217 (larvae). —Wheeler and Wheeler, 1968. Ent. Soc. Amer., Ann. 61: 205-222 (larvae). —Wheeler and Wheeler, 1970. Ent. Soc. Amer., Ann. 63: 648-656 (larvae).

Biology: Kannowski, 1963. Symp. Genet. et Biol. Ital. 12: 74-102 (flight activities). —Wilson and Regnier, 1971. Amer. Nat. 105: 279-289 (evolution of alarm-defense system).

Morphology: Blum and Wilson, 1964. Psyche 71: 28-31 (anatomical source of trail substances in formicine ants). —Hung, 1969. Ent. Soc. Amer., Ann. 62: 455-456 (chromosome numbers of various spp.).

#### TRIBE PLAGIOLEPIDINI

##### Genus PLAGIOLEPIS Mayr

*Plagiolepis* Mayr, 1861. Eurp. Formicid., p. 42.

Type-species: *Formica pygmaea* Latreille. Monotypic.

*Plagiolepis* subg. *Anacantholepis* Santschi, 1914. Meddel. Goteborgs Mus. Zool. 3: 36.

Type-species: *Plagiolepis (Anacantholepis) decora* Santschi. Monotypic.

*Aporomyrmex* Faber, 1969. Pflanzenschutzber. 39: 52.

Type-species: *Aporomyrmex ampeloni* Faber. Orig. desig.

*Plagiolepis* subg. *Paraplagiolepis* Faber, 1969. Pflanzenschutzber. 39: 65.

Type-species: *Plagiolepis zene* Starcke. Monotypic.

An Old World genus with a single introduced species found in the United States.

Taxonomy: Wheeler and Wheeler, 1953. Ent. Soc. Amer., Ann. 47: 129, 132 (larvae). —Brown, 1973. In Meggers, et al., Tropical forest ecosystems in Afr. and S. Amer., pp. 178-185.

**alluaudi** Emery, Calif. (Catalina Is.); W. Indies, Pacific Islands, apparently pantropical.

Introduced, probably native to Africa from where it has been widely distributed by commerce.

*Plagiolepis alluaudi* Emery, 1894. Soc. Ent. de France, Ann. 63: 71. ♀.

*Plagiolepis mactavishi* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24: 166. ♀.

*Plagiolepis foreli* Santschi, 1920. Soc. Vaud. des Sci. Nat., Bul. 53: 165. ♀.

*Plagiolepis foreli* var. *ornata* Santschi, 1920. Soc. Vaud. des Sci. Nat., Bul. 53: 166. ♀.

*Plagiolepis foreli* Mann, 1921. Harvard Univ., Mus. Comp. Zool., Bul. 64: 473. ♀. Preocc. by Santschi, 1920.

*Plagiolepis augusti* Emery, 1921. Soc. Ent. de Belg., Ann. 61: 317. N. name for *foreli* Mann.

Taxonomy: Smith, 1957. N. Y. Ent. Soc., Jour. 65: 196 (also biol. notes). —Brown, 1958. Acta Hym. 1: 49. —Wilson and Taylor, 1967. Pacific Ins. Monog. 14: 85-86 (Polynesia).

Biology: Phillips, 1934. (Hawaii Univ.) Expt. Sta. Pineapple Prod. Coop. Assoc., Bul. 15: 17-18 (in Hawaii). —Taylor and Wilson, 1961. Psyche 68: 143.

### Genus ACROPYGA Roger

*Acropyga* Roger, 1862. Berlin. Ent. Ztschr. 6: 242.

Type-species: *Acropyga acutiventris* Roger. Monotypic.

*Acropyga* subg. *Rhizomyrma* Forel, 1893. Ent. Soc. London, Trans., p. 347.

Type-species: *Acropyga (Rhizomyrma) goldii* Forel. Desig. by Wheeler, 1911.

*Acropyga* subg. *Atopodon* Forel, 1912. Rev. Suisse de Zool. 20: 771.

Type-species: *Acropyga (Atopodon) inersae* Forel. Desig. by Wheeler, 1913.

*Acropyga* subg. *Malacomyrma* Emery, 1922. Mus. Nat. Hung., Ann. 19: 109.

Type-species: *Acropyga silvestrii* Emery. Monotypic.

The small yellow ants of this genus are subterranean in habit and are fond of honeydew. According to Weber (1944) all the New World species may be obligate coccidophiles. Some species may be of economic importance because they tend and disperse coccids on the roots of coffee plants.

Revision: Weber, 1944. Ent. Soc. Amer., Ann. 37: 89-122 (New World spp.; also biol. and association with coccids).

Taxonomy: Wheeler and Wheeler, 1953. Ent. Soc. Amer., Ann. 47: 136 (larvae). —Snelling, 1973. Los Angeles Co. Mus., Contrib. Sci. 236: 6-7 (first record of genus in U. S.).

**epedana** Snelling, Ariz. (Montezuma Pass, 5800 ft., Huachuca Mts., Cochise Co.) Ecology: Specimens were found under a stone.

*Acropyga epedana* Snelling, 1973. Los Angeles Co. Mus., Contrib. Sci. 236: 7-8. ♀.

### TRIBE MYRMELACHISTINI

#### Genus MYRMELACHISTA Roger

*Myrmelachista* Roger, 1863. Berlin. Ent. Ztschr. 7: 162.

Type-species: *Myrmelachista kraatzii* Roger. Monotypic.

*Myrmelachista* subg. *Decamera* Roger, 1863. Berlin. Ent. Ztschr. 7: 166. Preocc. by Mulsant, 1842.

Type-species: *Myrmelachista (Decamera) nigella* Roger. Monotypic.

*Aphomomyrmex* subg. *Neaphomus* Menozzi, 1935. Zool. Jahrb., Abt. f. System 67: 324.

Synonymy questionable.

Type-species: *Aphomomyrmex (Neaphomus) goetschi* Menozzi. Monotypic.

*Hincksidris* Donisthorpe, 1944. Ent. Monthly Mag. 80: 59. N. name for *Decamera* Roger.

A Neotropical genus represented in the United States by a single species probably introduced into Florida.

Taxonomy: Wheeler, 1934. Harvard Univ., Mus. Comp. Zool., Bul. 77: 187-206. —Wheeler and Wheeler, 1953. Ent. Soc. Amer., Ann. 47: 129, 137 (larvae). —Kusnezov, 1959. Acta Zool. Lilloana (Tucuman) 17: 379.

**ramulorum** Wheeler. Fla. (Highland City, Polk Co.); W. Indies. Ecology: Specimens in Florida collected on sweet orange. Probably introduced.

*Myrmelachista ambigua ramulorum* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24: 155. ♀, ♀, ♂.

Taxonomy: Wheeler, 1934. Harvard Univ., Mus. Comp. Zool., Bul. 77: 189. —Smith, 1936. Puerto Rico Univ., Jour. Agr. 20: 872-873 (also biol. notes). —Wheeler and Wheeler, 1953. Ent. Soc. Amer., Ann. 47: 138 (larva).

Biology: Anonymous, 1968. FAO Plant Protect. Bul. 16: 53 (Fla. record; biol.).

#### TRIBE BRACHYMYRMECINI

##### Genus BRACHYMYRMEX Mayr

*Brachymyrmex* Mayr, 1868. Soc. Nat. Modena, Ann. 3: 163.

Type-species: *Brachymyrmex patagonicus* Mayr. Monotypic.

*Brachymyrmex* subg. *Brytscha* Santschi, 1925. Buenos Aires Mus. Nac. de Hist. Nat., An. 31: 652.

Type-species: *Brachymyrmex pilipes* Mayr. Orig. desig.

Most species of this New World genus are found south of the United States. They usually form small colonies in the soil under various objects and are easily transported by commerce in soil or plants. They are fond of honeydew and attend honeydew excreting insects.

Revision: Wheeler, 1903. Psyche 10: 102-103. —Santschi, 1923. Buenos Aires Mus. Nac. de Hist. Nat., An. 31: 650-674.

Taxonomy: Wheeler and Wheeler, 1953. Ent. Soc. Amer., Ann. 47: 129, 139 (larvae). —Wheeler and Wheeler, 1970. Ent. Soc. Amer., Ann. 63: 652 (larvae, *Brachymyrmecini*).

Biology: Arnaud and Quate, 1951. Pan-Pacific Ent. 27: 171 (note on swarming).

**depilis** Emery. N. S. s. to Fla. w. to B. C., Calif. Ecology: Nests are small and inconspicuous and are in the soil under stones, rotten wood, or other objects.

*Brachymyrmex heerii depilis* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 635. ♀.

*Brachymyrmex nanellus* Wheeler, 1903. Psyche 10: 102. ♀, ♂.

*Brachymyrmex depilis flavescens* Grundmann, 1952. Kans. Ent. Soc., Jour. 25: 117. ♀.

Taxonomy: Santschi, 1923. Buenos Aires Mus. Nac. de Hist. Nat., An. 31: 664. —Cole, 1940. Amer. Midland Nat. 24: 65. —Gregg, 1944. Ent. Soc. Amer., Ann. 37: 469. —Cole, 1953. Ent. News 64: 266. —Wheeler and Wheeler, 1953. Ent. Soc. Amer., Ann. 47: 139 (larva). —Wheeler and Wheeler, 1968. Ent. Soc. Amer., Ann. 61: 210 (larva).

Biology: Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21: 389. —Smith, 1927. Ent. News 38: 313. —Dennis, 1938. Ent. Soc. Amer., Ann. 37: 469. —Headley, 1952. Ent. Soc. Amer., Ann. 45: 436, 439. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 161-163. —Gregg, 1963. Ants of Colo., pp. 447-449. —Wheeler and Wheeler, 1973. Ants of Deep Canyon, pp. 108-109.

**obscurior** Forel. Fla., s. Tex.; Mexico, Central Amer., W. Indies. Possibly introduced into U. S. *Brachymyrmex heerii* var. *obscurior* Forel, 1893. Ent. Soc. London, Trans., p. 345. ♀, ♀, ♂.

Taxonomy: Santschi, 1923. Buenos Aires Mus. Nac. de Hist. Nat., An. 31: 654, 666. —Smith, 1936. Puerto Rico Univ., Jour. Agr. 20: 866-867 (also biol. notes). —Brown, 1957. Harvard Univ., Mus. Comp. Zool., Bul. 116: 237.

Biology: Plank and Smith, 1940. Puerto Rico Univ., Jour. Agr. 24: 60.

#### TRIBE CAMPONOTINI

##### Genus CAMPONOTUS Mayr

This large genus of ants is found throughout North America and most other parts of the world. They are commonly referred to as carpenter ants, especially members of the subgenus *Camponotus*, because of their habit of nesting in wood. However, many species nest in the soil,

under stones, or in hollow twigs or branches.

Many subgeneric groupings have been proposed for *Camponotus* on a worldwide basis, many of which may or may not be valid or may eventually represent distinct genera. Brown (1973) gave 54 genus-group names to be considered with *Camponotus*. Seven subgenera have been recognized in North America, and these are separated here as in the past literature.

Revision: Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 667-682. —Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 295-354.

Taxonomy: Emery, 1920. Rev. Zool. Afr. 8: 16-19 (subgenera). —Wheeler, 1921. Psyche 28: 17. —Wheeler and Wheeler, 1953. Ent. Soc. Amer., Ann. 46: 181 (larvae). —Wheeler and Wheeler, 1968. Ent. Soc. Amer., Ann. 61: 216 (larvae). —Wheeler and Wheeler 1970. Ent. Soc. Amer., Ann. 63: 649 (larvae). —Brown, 1973. In Meggers, et al., Tropical forest ecosystems in Afr. and S. Amer., pp. 178-185 (genus-group names).

Biology: Smith, 1942. Ent. News 53: 133-135 (effect of reduced food supply on stature). —Smith, 1942. Tenn. Acad. Sci., Jour. 17: 367-373 (polymorphism). —Riordan, 1960. Insectes Sociaux 7: 353-355 (location of nests by a radioactive isotope). —Sanders, 1964. Canad. Ent. 96: 894-909 (biol. of carpenter ants in N. B.). —Patrick, 1969. Amer. Midland Nat. 82: 605-610 (changes in carpenter ants harboring dicrocoeliid metacercariae). —Sanders and Baldwin, 1969. Canad. Ent. 101: 416-418 (Iridium-192 as a tag for carpenter ants). —Sanders, 1970. Ecology 51: 865-873 (distribution of carpenter ant colonies in spruce fir forests in Ont.). —Ayre and Blum, 1971. Physiological Zool. 44: 77-83 (attraction and alarm). —Sanders, 1972. Canad. Ent. 104: 1681-1687 (seasonal and daily activity patterns in n.w. Ont.). —Sanders, 1973. Ent. Soc. Ontario, Proc. 102: 13-16 (aggregation of alate carpenter ants in Ont.).

#### Genus CAMPONOTUS Subgenus CAMPONOTUS Mayr

*Camponotus* Mayr, 1861. Die Europäischen Formiciden, pp. 25, 35.

Type-species: *Formica ligniperda* Latreille. Desig. by Bingham, 1903.

Most species of this subgenus build their nests in decaying wood. Some are common house infesting ants that make their nest in the timber and woodwork of buildings and tunnel nest passages into adjacent wood. Dry, sound wood is rarely attacked, and the presence of nests of carpenter ants in buildings is usually evidence that the wood was damp and partially decayed.

**americanus** Mayr. Ont. s. to Fla. w. to Mich., Iowa, Mo., Okla., Tex. Ecology: Prefers to nest in the soil, usually under stones or rotten logs.

*Camponotus americanus* Mayr, 1862. Zool.-Bot. Gesell. Wien, Verh. 12: 661. ♂, ♀.

*Camponotus (Camponotus) castaneus* stirps *rufinasis* Santschi, 1936. Rev. d. Ent. 6: 204. ♀.

Taxonomy: Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 299, 323-325 (each caste). —Cole, 1940. Amer. Midland Nat. 24: 82, 84 (also biol. notes). —Gregg, 1944. Ent. Soc. Amer., Ann. 37: 477. —Wheeler and Wheeler, 1953. Ent. Soc. Amer., Ann. 46: 185 (larva). —Wheeler and Wheeler, 1958. Ent. Soc. Amer., Ann. 61: 216 (larva).

Biology: Dennis, 1938. Ent. Soc. Amer., Ann. 31: 273, 275, 300-301.

Morphology: Ayre and Blum, 1971. Physiological Zool. 44: 77-83 (attraction and alarm by pheromones).

**ferrugineus** (Fabricius). Mass., N. Y. s. to Ga. w. to Mich., Ill., Nebr., Kans. Ecology: Nests are located in and beneath well-rotted logs and stumps with galleries often extending into the soil. They have also been found in dead standing trees and occasionally in moist or faulty wood in buildings. Red carpenter ant.

*Formica ferruginea* Fabricius, 1798. Sup. Ent. System., p. 279. ♂, ♀.

Taxonomy: Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 668. —Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 299, 338-339 (each caste; biol. notes). —Wheeler, 1917. Conn. State Geol. and Nat. Hist. Survey Bul. 22: 600-601. —Cole, 1940. Amer. Midland Nat. 24: 86. —Brown, 1950. Ent. News 61: 158-160. —Wheeler and Wheeler, 1953. Ent. Soc. Amer., Ann. 46: 188 (larva).

- Biology: Pricer, 1908. Biol. Bul. 14: 177-218. —Dennis, 1938. Ent. Soc. Amer., Ann. 31: 301-302. —Williams, 1961. Ohio Jour. Sci. 61: 279 (habits; nest). —Smith, 1965. U. S. Dept. Agr., Tech. Bul. 1326, pp. 67-69 (economic importance).
- Morphology: Tanquary, 1913. Ill. State Lab. Nat. Hist., Bul. 9: 454-475 (embryology).
- herculeanus** (Linnaeus). Newfoundland (Labrador and insular) w. to Alaska s. to N. Y., Pa., Wis., Minn., N. Dak., Colo., N. Mex., Utah, Oreg.; Eurasia. Ecology: Probably the dominant ant in the forests of boreal and alpine N. Amer. Large colonies are found in rotting logs and stumps, especially conifers.
- Formica herculeana* Linnaeus, 1758. Syst. Nat., Ed. 10, p. 579. ♀.
- Camponotus herculeanus* var. *Whymperi* Forel, 1902. Ent. Soc. London, Trans., p. 699. ♀, ♀.
- Taxonomy: Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 299, 330-333 (each caste; biol. notes). —Cole, 1942. Amer. Midland Nat. 28: 387. —Creighton, 1950. Harvard Univ., Mus. Comp. Zool., Bul. 104: 367. —Wheeler and Wheeler, 1953. Ent. Soc. Amer., Ann. 46: 185-187 (larva). —Yasumatsu and Brown, 1957. Kyushu Univ., Fac. Agr., Jour. 11: 45. —Arnoldi, 1967. Zool. Zhur. 46: 1817-1818. —Wheeler and Wheeler, 1970. Ent. Soc. Amer., Ann. 63: 651 (larva).
- Biology: Jones, 1929. Colo. Agr. Expt. Sta. Bul. 341, 96 pp. (tends 19 spp. in 6 gen. of aphids on 12 spp. of host plants). —Gregg, 1946. Amer. Midland Nat. 35: 753. —Brown, 1949. Ent. News 60: 99. —Holldobler, 1950. Ztschr. f. Angew. Ent. 31: 583 (biol. and habits in Europe). —Weber, 1950. Amer. Ent. Soc., Trans. 76: 188. —Perttunen, 1955. Ann. Ent. Fenn. 21: 38 (reactions to air humidity). —Brown, 1955. Ent. News 66: 47-48. —Holldobler, 1961. Insectes Sociaux 8: 14 (rhythmical behavior). —Holldobler, 1962. Waldhygiene 4: 228 (nest types, economic importance in Germany). —Holldobler, 1962. Ztschr. f. Angew. Ent. 49: 338. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 164-165. —Gregg, 1963. Ants of Colo., pp. 656-660. —Sanders, 1964. Canad. Ent. 96: 894 (biol. and habits, N. B.). —Sanders, 1972. Canad. Ent. 101: 1618-1687 (seasonal and daily activity patterns, Ont.).
- Morphology: Ayre, 1963. Ent. Expt. and Appl. 6: 165-170 (feeding behavior and digestion). —Ayre and Blum, 1971. Physiological Zool. 44: 77-83 (attraction and alarm by pheromones).
- laevigatus** (Smith). Mont., Colo., N. Mex. w. to B. C., Oreg., Calif.; Mexico. Ecology: Found in wooded and forested areas where it nests in rotting logs and stumps. Occasionally found in buildings.
- Formica laevigata* Smith, 1858. Cat. Hym. Brit. Mus., v. 6, p. 55. ♀, ♀.
- Taxonomy: Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 299, 327-330 (each caste; biol. notes). —Cole, 1942. Amer. Midland Nat. 28: 387-388. —Wheeler and Wheeler, 1968. Ent. Soc. Amer., Ann. 61: 216 (larva).
- Biology: Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 556. —Eckert and Mallis, 1937. Calif. Agr. Expt. Sta. Cir. 342: 29. —Furniss, 1944. Oreg. Agr. Expt. Sta. Cir. 158: 1-12. —Gregg, 1963. Ants of Colo., pp. 660-663.
- modoc** Wheeler. S. Dak., Colo. w. to B. C., Oreg., Calif. Ecology: Found in forested areas where it makes its nests in rotting logs and stumps. Has been considered a subspecies of *herculeanus* or *pennsylvanicus* by various authors.
- Camponotus* (*Camponotus*) *herculeanus* var. *modoc* Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 299, 333. ♀, ♀, ♂.
- Taxonomy: Cole, 1942. Amer. Midland Nat. 28: 387. —Brown, 1950. Ent. News 61: 158.
- Biology: Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 557. —Eckert and Mallis, 1937. Calif. Agr. Expt. Sta. Cir. 342: 29. —Mallis, 1941. South. Calif. Acad. Sci., Bul. 40: 90. —Furniss, 1944. Oreg. Agr. Expt. Sta. Cir. 158: 1-12. —Gregg, 1963. Ants of Colo., pp. 665-669.
- novaeboracensis** (Fitch). N. S., Que. s. to Va. w. to B. C., Oreg., Utah, Colo. Ecology: Prefers wooded areas where it normally nests in rotting logs and stumps. Sometimes a house pest.
- Formica Novaeboracensis* Fitch, 1855. N. Y. State Agr. Soc., Trans. 14: 766. ♀.

- Camponotus herculeanus ligniperdus* var. *pictus* Forel, 1879. Soc. Vaud. des Sci. Nat., Bul. 16: 59. ♀, ♀, ♂.
- Camponotus herculeanus ligniperdus* var. *noveboracensis* Forel, 1899. Soc. Ent. de Belg., Ann. 43: 447. Emend.
- Camponotus herculeanus ligniperda* var. *rubens* Wheeler, 1906. Psyche 13: 41. ♀, ♂.
- Taxonomy: Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 300, 340 (each caste). —Buren, 1944. Iowa State Col., Jour. Sci. 18: 293. —Wheeler and Wheeler, 1953. Ent. Soc. Amer., Ann. 46: 182-185 (larva). —Wheeler and Wheeler, 1970. Ent. Soc. Amer., Ann. 63: 651 (larva).
- Biology: Jones, 1929. Colo. Agr. Expt. Sta. Bul. 341: 96 pp. (attends aphids). —Gregg, 1944. Ent. Soc. Amer., Ann. 37: 457-458. —Wheeler and Wheeler, 1944. N. Dak. Hist. Quart. 11: 250-251. —Kannowski, 1959. Insectes Sociaux 6: 134-135. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 165-168. —Gregg, 1963. Ants of Colo., pp. 663-665. —Sanders, 1964. Canad. Ent. 96: 896 (biology and habits, N. B.). —Gotwald, 1968. N. Y. Ent. Soc., Jour. 76: 278-296 (food gathering behavior). —Sanders, 1972. Canad. Ent. 104: 1681-1687 (seasonal and daily activity pattern, Ont.).
- Morphology: Smith, 1942. Tenn. Acad. Sci., Jour. 17: 368.
- pennsylvanicus** (DeGeer). N. B., Que. s. to Fla. w. to N. Dak., Tex. Ecology: Nests are found in live and dead trees, rotting logs and stumps, and in wood products such as fences, telegraph poles, and buildings. A common and important house infesting ant because of its adaptability to nest in woodwork of buildings. It commonly feeds on household foods, and it is annoying. Nests are started in buildings usually in moist or faulty wood. The first native North American ant to be described. Black carpenter ant.
- Formica pennsylvanica* (!) DeGeer, 1773. Mem. Serv. Hist. Ins., v. 3, p. 603. ♀, ♀, ♂.
- Camponotus herculeanus herculeanus herculeano-pennsylvanicus* Forel, 1879. Soc. Vaud. des Sci. Nat., Bul. 16: 57. ♀ (?).
- Camponotus herculeanus pennsylvanicus* var. *mahican* Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 299, 338. N. name for *herculeano-pennsylvanicus* Forel.
- Taxonomy: Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 299, 335-336 (each caste). —Wheeler, 1917. Conn. State Geol. and Nat. Hist. Survey Bul. 22: 600. —Buren, 1944. Iowa State Col., Jour. Sci. 18: 293. —Townsend, 1945. Ky. Agr. Expt. Sta. Cir. 59: 1-27 (references to 1945). —Wheeler and Wheeler, 1953. Ent. Soc. Amer., Ann. 46: 187-188 (larva). —Wheeler and Wheeler, 1970. Ent. Soc. Amer., Ann. 63: 651 (larva).
- Biology: McCook, 1877. Amer. Ent. Soc., Trans. 6: 253-296. —Pricer, 1908. Biol. Bul. 14: 177-218. —Herrick, 1914. Insects Injurious to the Household and Annoying to Man, pp. 177-178. —Gibson, 1916. Canad. Ent. 48: 365-366. —Graham, 1918. Minn. State Ent. Rpt. 17: 32-40 (as destroyers of sound wood). —Back, 1937. U. S. Dept. Agr. Leaflet 147. —Van Pelt, 1958. Tenn. Acad. Sci., Jour. 33: 120-122 (parasitism by a fungus). —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 168-170. —Sanders, 1964. Canad. Ent. 96: 899 (biology and habits, N. B.). —Smith, 1965. U. S. Dept. Agr. Tech. Bul. 1326, pp. 63-67 (economic importance). —Sanders, 1972. Canad. Ent. 104: 1681-1687 (seasonal and daily activity patterns, Ont.).
- Morphology: McCook, 1878. Phila. Acad. Nat. Sci., Proc. 30: 15-19. —Fielde, 1903. Biol. Bul. 5: 320-325. —Fielde and Parker, 1904. Phila. Acad. Nat. Sci., Proc. 56: 642-649. —Forbes, 1938. Ent. Soc. Amer., Ann. 31: 181-195 (anatomy and histology of worker). —Smith, 1942. Tenn. Acad. Sci., Jour. 17: 367-373. —Forbes, 1952. N. Y. Ent. Soc., Jour. 60: 157-171 (male genitalia). —Forbes, 1954. Jour. Morph. 95: 523-548 (male reproductive system). —Forbes, 1956. Insectes Sociaux 3: 505-511 (male digestive tract). —Forbes and McFarlane, 1961. N. Y. Ent. Soc., Jour. 69: 92-103 (comparative anatomy of digestive glands of female and male). —Keister, 1963. Ent. Soc. Amer., Ann. 56: 336-340 (tracheal system). —Hermann and Blum, 1968. Psyche 75: 216-227 (poison apparatus). —Ayre and Blum, 1971. Physiological Zool. 44: 77-83 (attraction and alarm by pheromones).
- quercicola** Smith. Calif. (Los Angeles Co. to San Diego Co.). Ecology: Nests in dead limbs of *Quercus agrifolia*; nocturnal.
- Camponotus* (*Camponotus*) *quercicola* Smith, 1953. N. Y. Ent. Soc., Jour. 61: 211-214. ♀, ♂.

**schaefferi** Wheeler. S. Ariz. Ecology: Nests in dead oak limbs at elevations of about 5000 to 8000 feet.

*Camponotus schaefferi* Wheeler, 1909. N. Y. Ent. Soc., Jour. 17: 88. ♀, ♀.

Taxonomy: Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 300, 344-345 (also biol. notes).

Biology: Wheeler, 1917. Amer. Acad. Arts. and Sci., Proc. 52: 557.

**texanus** Wheeler. Tex. Ecology: Nests have been found in oak logs.

*Camponotus texanus* Wheeler, 1903. Psyche 10: 108. ♀, ♀, ♂.

Taxonomy: Wheeler, 1909. N. Y. Ent. Soc., Jour. 17: 90. —Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 300, 344 (also biol. note).

#### Genus CAMPONOTUS Subgenus TANAEMYRMEX Ashmead

*Tanaemyrmex* Ashmead, 1905. Canad. Ent. 37: 384.

Type-species: *Formica longipes* Gerstaecker. Orig. desig.

*Myrmoturba* Forel, 1912. Soc. Ent. de Belg., Mem. 20: 91.

Type-species: *Formica maculata* Fabricius. Desig. by Wheeler, 1913.

Most species of this subgenus nest in the soil under stones or other objects; occasionally nests may be surmounted by a small crater. The ants rarely nest in wood, but, if so, the wood is usually buried in the soil.

**acutirostris** Wheeler. Tex., N. Mex., Ariz. Ecology: Nests have been found in the ground under stones.

*Camponotus (Camponotus) acutirostris* Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 298, 317. ♀, ♀, ♂.

*Camponotus acutirostris* var. *clarigaster* Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34: 420. ♀.

Taxonomy: Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 561-562.

**castaneus** (Latreille). N. Y. s. to Fla. w. to Iowa, Okla., Tex. Ecology: Nests in rotting logs and stumps, exposed soil, or in soil under objects. Occasionally enters buildings usually in search of food.

*Formica castanea* Latreille, 1802. Hist. Nat. Fourmis, p. 118. ♀, ♀, ♂.

*Formica mellea* Say, 1831. Descr. N. Spp. N. Amer. Ins. Found in La. by Jos. Barabino, p. 14. ♂.

*Camponotus clarus* Mayr, 1862. Zool.-Bot. Gesell. Wien, Verh. 12: 660. ♀.

Taxonomy: Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 299, 321-323. —Cole, 1940. Amer. Midland Nat. 24: 82, 84.

Biology: Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21: 402. —Gregg, 1944. Ent. Soc. Amer., Ann. 37: 457, 477. —Smith, 1965. U. S. Dept. Agr., Tech. Bul. 1326, pp. 60-62.

**dumetorum** Wheeler. S. Calif. Ecology: Nests are common in the chaparral and are in the soil usually surmounted by flat craters.

*Camponotus (Camponotus) maculatus dumetorum* Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 354. ♀, ♂.

Taxonomy: Snelling, 1970. Ent. Soc. Wash., Proc. 72: 390-397.

Biology: Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 560. —Mallis, 1941. South. Calif. Acad. Sci., Bul. 40: 90-91.

**festinatus** (Buckley). Tex., Colo., N. Mex., Ariz., Calif.; Mexico. Ecology: Nests in the ground under stones, logs, or dried cow dung.

*Formica festinata* Buckley, 1866. Ent. Soc. Phila., Proc. 6: 165. ♀, ♀.

*Camponotus (Camponotus) fumidus* var. *pubicornis* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 668, 670. ♀.

*Camponotus fragilis* Pergande, 1893. Calif. Acad. Sci., Proc. 4: 26. ♀.

*Camponotus (Camponotus) fumidus* var. *spureus* Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 299, 315. ♀, ♀.



Taxonomy: Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 312 (also biol. notes). —Snelling, 1968. Ent. Soc. Wash., Proc. 70: 350-355. —Wheeler and Wheeler, 1970. Ent. Soc. Amer., Ann. 63: 651 (larva).

Biology: Wheeler, 1901. Amer. Nat. 35: 518, 520, 533.

**incensus** Wheeler. Fla. (Pigeon Key near Miami).

*Camponotus (Tanaemyrmex) incensus* Wheeler, 1932. N. Y. Ent. Soc., Jour. 40: 14. ♀.

**ocreatus** Emery. N. Mex., Ariz., s. Nev., s. Calif.; Mexico. Ecology: Nests are found under stones.

*Camponotus (Camponotus) maculatus ocreatus* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 668, 673. ♀.

*Camponotus (Camponotus) acutirostris primipilaris* Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 298, 319. ♀, ♀.

Taxonomy: Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 561-562. —Wheeler and Wheeler, 1970. Ent. Soc. Amer., Ann. 63: 651 (larva).

Biology: Cole, 1954. Tenn. Acad. Sci., Jour. 29: 272. —Cole, 1966. Brigham Young Univ., Sci. Bul., Biol. Ser. 7: 20 (Nev. Test Site). —Wheeler and Wheeler, 1973. Ants of Deep Canyon, p. 111.

**sansabeanus bulimosus** Wheeler. N. Mex., Ariz. Ecology: Nests in the ground under stones.

*Camponotus (Camponotus) maculatus bulimosus* Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 308. ♀, ♀, ♂.

Biology: Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 560-561. —Cole, 1954. Tenn. Acad. Sci., Jour. 29: 272.

**sansabeanus sansabeanus** (Buckley). Ark., La. w. to Colo., Utah, Ariz., s. Calif. Ecology: Nests under rocks and stones in dry woods.

*Formica San Sabeana* Buckley, 1866. Ent. Soc. Phila., Proc. 6: 167. ♀, ♀, ♂.

Taxonomy: Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 672-673. —Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 298, 307-308 (also biol. notes). —Cole, 1942. Amer. Midland Nat. 28: 387. —Wheeler and Wheeler, 1953. Ent. Soc. Amer., Ann. 46: 196 (larva).

Biology: Wheeler, 1901. Amer. Nat. 35: 518, 520, 533. —Wheeler, 1910. Ants, pp. 349, 393. —Gregg, 1963. Ants of Colo., pp. 669-671. —Wheeler and Wheeler, 1973. Ants of Deep Canyon, p. 111 (half of collections belong to subsp. *torrefactus*).

Morphology: Wheeler, 1910. Ants, pp. 24, 49.

**sansabeanus torrefactus** Wheeler. Colo., Ariz., Utah, Nev. Ecology: Nests are found under stones.

*Camponotus (Camponotus) maculatus sansabeanus* var. *torrefactus* Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 298, 308. ♀, ♂.

Taxonomy: Cole, 1942. Amer. Midland Nat. 28: 387, 388 (also biol. note).

Biology: Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 559.

**semitestaceus** Emery. Okla., Tex. w. to Wash., Oreg., Calif.; Mexico. Ecology: Nests are found under stones or in soil surmounted by low craters. Most U. S. records and references in the literature to *maccooki* Forel refer to *semitestaceus*; *maccooki* is apparently restricted to Guadalupe Is.

*Camponotus (Camponotus) maculatus vicinus* var. *semitestaceus* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 668, 672. ♀.

Taxonomy: Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 298, 304, 306. —Snelling, 1970. Ent. Soc. Wash., Proc. 72: 390-397 (separation of *maccooki* and *semitestaceus*).

Biology: Wheeler, 1906. Amer. Mus. Nat. Hist., Bul. 22: 345. —Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 559. —Essig, 1926. Ins. West. N. Amer., p. 868. —Cole, 1934. Ent. Soc. Amer., Ann. 27: 403. —Eckert and Mallis, 1937. Calif. Agr. Expt. Sta. Cir. 342: 28. —Mallis, 1941. South. Calif. Acad. Sci., Bul. 40: 91-92. —Cole, 1966. Brigham Young Univ., Sci. Bul., Biol. Ser. 7: 19-20. —Wheeler and Wheeler, 1973. Ants of Deep Canyon, pp. 112-113.

- socius** Roger. N. C. s. to Fla. w. to La.; Brazil. Ecology: Nests are built in branches and rotten logs that are covered by sand. Introduced into the U. S.  
*Camponotus socius* Roger, 1863. Berlin. Ent. Ztschr. 7: 140. ♀.  
*Camponotus (Tanaemyrmex) socius* var. *osceola* Wheeler, 1932. N. Y. Ent. Soc., Jour. 40: 15. ♀.  
 Taxonomy: Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 298, 319-321 (each caste).  
 Biology: Wheeler, 1932. N. Y. Ent. Soc., Jour. 40: 14-15. —Creighton, 1950. Harvard Univ., Mus. Comp. Zool., Bul. 104: 374. —Holldobler, 1971. Z. Vergl. Physiol. 75: 123-142 (recruitment behavior).
- tortuganus** Emery. S. Fla. Ecology: May nest in soil under stones or under rotting wood. A frequent house pest and reported to have been found nesting in siding and roofing of buildings.  
*Camponotus maculatus tortuganus* Emery, 1895. Zool. Jahrb., Abt. f. System. 8: 336. ♀.  
 Taxonomy: Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 299, 310-312 (each caste).  
 Biology: Wheeler, 1932. N. Y. Ent. Soc., Jour. 40: 13-14. —Smith, 1965. U. S. Dept. Agr., Tech. Bul. 1326, pp. 62-63.
- vafer** Wheeler. Ariz. (Huachuca Mts., 5000 to 6000 ft.). Ecology: Nests were found under stones.  
*Camponotus (Camponotus) vafer* Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 299, 315. ♀, ♀.  
**vicinus** Mayr. Man., N. Dak., Colo., Okla., w. to B. C., Oreg., Calif.; Mexico. Ecology: Nests in soil under stones or in rotting wood buried in the soil.  
*Formica Tejonica* Buckley, 1866. Ent. Soc. Phila., Proc. 6: 161. ♂. Questionably the same as *vicinus*.  
*Camponotus vicinus* Mayr, 1870. Zool.-Bot. Gesell. Wien, Verh. 20: 940. ♀.  
*Camponotus (Camponotus) maculatus vicinus* var. *nitidiventris* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 668, 672. ♀.  
*Camponotus (Camponotus) maculatus vicinus* var. *infernalis* Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 298, 305. ♀.  
*Camponotus (Camponotus) maculatus vicinus* var. *luteangulus* Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 298, 304. ♀, ♂.  
*Camponotus (Camponotus) maculatus vicinus* var. *maritimus* Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 298, 305. ♀, ♀, ♂.  
*Camponotus (Camponotus) maculatus vicinus* var. *plorabilis* Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 298, 303. ♀, ♀, ♂.  
*Camponotus (Myrmoturba) maculatus vicinus* var. *subrostrata* Forel, 1914. Deut. Ent. Ztschr., p. 620. ♀.  
*Camponotus (Myrmoturba) maculatus Maccooki berkeleyensis* Forel, 1914. Deut. Ent. Ztschr., p. 619. ♀.  
 Taxonomy: Cole, 1942. Amer. Midland Nat. 28: 387. —Creighton, 1950. Harvard Univ., Mus. Comp. Zool., Bul. 104: 381. —Snelling, 1970. Ent. Soc. Wash., Proc. 72: 390-397. —Wheeler and Wheeler, 1968. Ent. Soc. Amer., Ann. 61: 220 (larva).
- Biology: Wheeler, 1906. Amer. Mus. Nat. Hist., Bul. 22: 345. —Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 599-560. —Mallis, 1941. South. Calif. Acad. Sci., Bul. 40: 92. —McClure, 1943. Ecol. Monog. 13: 19. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 170-171. —Gregg, 1963. Ants of Colo., pp. 671-675. —Cole, 1966. Brigham Young Univ., Sci. Bul., Biol. Ser. 7: 20 (Nev. Test Site). —Wheeler and Wheeler, 1973. Ants of Deep Canyon, pp. 113-114.

#### Genus CAMPONOTUS Subgenus MYRMOTHRIX Forel

*Myrmothrix* Forel, 1912. Soc. Ent. de Belg., Mem. 20: 91.

Type-species: *Formica abdominalis* Fabricius. Desig. by Wheeler, 1913.

Most members of this subgenus are Neotropical with two forms extending into southern United States.

Revision: Santschi, 1936. Rev. de Ent. 6: 207-218.

**abdominalis floridanus** (Buckley). N. C. s. to Fla. w. to s. Miss. Ecology: Nests are in and under rotten logs and stumps, usually in damp situations. A house infesting ant, especially in Florida, where it is known to nest in the woodwork of buildings and feed on household foods. May also damage beehives. *C. (M.) abdominalis abdominalis* (F.) occurs in Central and South America. Florida carpenter ant.

*Formica Floridana* Buckley, 1866. Ent. Soc. Phila., Proc. 6: 161. ♀.

*Camponotus atriceps* stirps *Yankee* Forel, 1884. Soc. Vaud. des Sci. Nat., Bul. 20: 340. ♀.

Taxonomy: Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 668. —Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 299, 325-326. —Santschi, 1936. Rev. de Ent. 6: 213-214.

Biology: Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 326. —Smith, 1965. U. S. Dept. Agr., Tech. Bul. 1326, pp. 69-70 (economic importance).

**abdominalis transvectus** Wheeler. S. Tex.; Mexico.

*Camponotus (Camponotus) abdominalis transvectus* Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 299, 326. ♀, ♀, ♂.

Taxonomy: Santschi, 1936. Rev. de Ent. 6: 213.

### Genus CAMPONOTUS Subgenus MYRMENTOMA Forel

*Myrmentoma* Forel, 1912. Soc. Ent. de Belg., Mem. 20: 92.

Type-species: *Formica lateralis* Olivier. Desig. by Wheeler, 1913.

The Nearctic forms of this subgenus nest in insect galls, in branches and stems of plants, under bark of trees, in wood and buildings, and sometimes in the soil. Colonies are small, consisting of a few dozen to several hundred individuals. The listing below essentially follows that of Creighton (1950) though there will undoubtedly be some changes in the near future.

Taxonomy: Wheeler, 1910. N. Y. Ent. Soc., Jour. 18: 216-232. —Creighton, 1950. Harvard Univ., Mus. Comp. Zool., Bul. 104: 382-390.

**anthrax** Wheeler. S. Calif. Ecology: Nests were found in soil under large stones.

*Camponotus anthrax* Wheeler, 1911. N. Y. Ent. Soc., Jour. 19: 96. ♀, ♀, ♂.

Taxonomy: Wheeler and Wheeler, 1970. Ent. Soc. Amer., Ann. 63: 650 (larva).

Biology: Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 558. —Mallis, 1941. South. Calif. Acad. Sci., Bul. 40: 89.

**caryae caryae** (Fitch). N. Y. s. to D. C. w. to Mich., Ohio. Ecology: Apparently associated with trees, especially hickory.

*Formica caryae* Fitch, 1855. N. Y. State Agr. Soc., Trans. 14: 855. ♀, ♀, ♂.

*Camponotus marginatus discolor* var. *cnemidatus* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 669, 678. ♀.

Taxonomy: Smith, 1940. Ent. Soc. Wash., Proc. 42: 137-141 (each caste; biol. note).

**caryae clarithorax** Emery. S. Calif.

*Camponotus marginatus discolor* var. *clarithorax* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 670, 678. ♀, ♀, ♂.

Taxonomy: Wheeler, 1910. N. Y. Ent. Soc., Jour. 18: 222, 231-232 (each caste). —Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 301.

Biology: Mallis, 1941. South. Calif. Acad. Sci., Bul. 40: 89.

**caryae discolor** (Buckley). Ohio, S. C., Fla. w. to N. Dak., Iowa, Kans., Tex. Ecology: Nests are in plant cavities in twigs, branches, under bark, in logs and stumps, or in insect galls. A house infesting ant that may nest in woodwork in houses, especially in preformed cavities or in rotting or faulty wood.

*Formica discolor* Buckley, 1866. Ent. Soc. Phila., Proc. 6: 166. ♀, ♀.

Taxonomy: Wheeler, 1910. N. Y. Ent. Soc., Jour. 18: 222, 230-231 (each caste). —Buren, 1944. Iowa State Col., Jour. Sci. 18: 293.

Biology: Wheeler, 1902. Tex. Acad. Sci., Trans. 4: 23. —Wesson and Wesson, 1940. Amer.

Midland Nat. 24: 103. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 172-173. —Smith, 1965. U. S. Dept. Agr., Tech. Bul. 1326, pp. 70-71.

*essigi* Smith. Idaho, Oreg., Nev., Calif.

*Camponotus caryae* var. *essigi* Smith, 1923. Ent. News 24: 306. ♀.

Biology: Mallis, 1941. South. Calif. Acad. Sci., Bul. 40: 89.

*hyatti bakeri* Wheeler. Calif. (Channel Islands). Ecology: Nests in soil.

*Camponotus hyatti* var. *bakeri* Wheeler, 1904. Amer. Mus. Nat. Hist., Bul. 20: 271. ♀, ♀.

Taxonomy: Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 300, 346.

*hyatti hyatti* Emery. Nev., Calif.; Mexico (Baja Calif.). Ecology: Colonies have been found in the stem of *Yucca* and in soil under a dead juniper limb.

*Camponotus* (*Camponotus*) *hyatti* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 669, 680. ♀.

Taxonomy: Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 300, 345-346.

Biology: Cole, 1966. Brigham Young Univ., Sci. Bul., Biol. Ser. 7: 19 (Nev. Test Site).

*nearcticus* Emery. Ont. s. to Fla. w. to N. Dak., Colo., Tex.; B. C. s. to Idaho, Calif. Ecology:

Forms small colonies in dead twigs and branches, under bark of live and dead trees, in insect galls, pine cones, and rotting logs and stumps; also in wood products such as fence posts and in woodwork of houses, especially the roofing.

*Formica americana* Buckley, 1866. Ent. Soc. Phila., Proc. 6: 154. ♀, ♀. Questionably the same as *nearcticus*.

*Camponotus* (*Camponotus*) *marginatus* var. *nearcticus* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 669, 675. ♀, ♀.

*Camponotus* (*Camponotus*) *marginatus* var. *minutus* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 669, 676. ♀, ♀.

*Camponotus* (*Camponotus*) *marginatus* var. *decipiens* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 669, 676. ♀, ♀.

*Camponotus fallax fallax* var. *pardus* Wheeler, 1910. N. Y. Ent. Soc., Jour. 18: 222, 225. ♀, ♀, ♂.

*Camponotus fallax fallax* var. *tanquaryi* Wheeler, 1910. N. Y. Ent. Soc., Jour. 18: 222, 226. ♀, ♀, ♂.

*Camponotus fallax rasilis* var. *pavidus* Wheeler, 1910. N. Y. Ent. Soc., Jour. 18: 222, 228. ♀, ♀.

Taxonomy: Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 300. —Buren, 1944. Iowa State Col., Jour. Sci. 18: 293. —Wheeler and Wheeler, 1953. Ent. Soc. Amer., Ann. 46: 193 (larva).

Biology: Wheeler, 1906. Amer. Mus. Nat. Hist., Bul. 21: 402-403. —Wheeler, 1910. N. Y. Ent. Soc., Jour. 18: 220-221. —Davis and Bequaert, 1922. Brooklyn Ent. Soc., Bul. 17: 24.

—Kannoswki, 1959. Insectes Sociaux 6: 134. —Gregg, 1963. Ants of Colo., pp. 675, 677.

—Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 173-174. —Smith, 1965. U. S. Dept. Agr., Tech. Bul. 1326, pp. 72-73 (economic importance).

*nevadensis* Gregg. Nev. (Fuller Lake, 3 mi. S. Verdi, 6000 ft.).

*Camponotus* (*Myrmentoma*) *nevadensis* Gregg, 1973. Southwest. Nat. 18: 39-43. ♀, ♀, ♂.

*sayi* Emery. N. C. s. to Fla. w. to Nebr., Kans., Colo., Ariz., Calif. Ecology: The small colonies are found in insect galleries in wood, in twigs and branches, insect galls, under bark, in stalks of plants, and in rotting logs and stumps. A house infesting ant which may nest in woodwork and feed on human foods. In most literature as *rasilis* Wheeler.

*Camponotus* (*Camponotus*) *sayi* Emery, 1894. Zool. Jahrb., Abt. f. System. 7: 679. ♀.

*Camponotus sayi* var. *bicolor* Pergande, 1894. Calif. Acad. Sci., Proc. 4: 161. ♀, ♀, ♂. Preocc. in *Camponotus* by Latreille, 1798.

*Camponotus fallax rasilis* Wheeler, 1910. N. Y. Ent. Soc., Jour. 18: 222, 227. ♀, ♀, ♂.

*Camponotus sayi californica* Emery, 1925. In Wytsman, Gen. Ins. 183: 118. N. name for *bicolor* Pergande.

Taxonomy: Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 300. —Buren, 1944. Iowa State Col., Jour. Sci. 18: 293-294. —Snelling, 1968. Ent. Soc. Wash., Proc. 70: 355-358.

Biology: Wheeler, 1910. N. Y. Ent. Soc., Jour. 18: 228. —Dennis, 1938. Ent. Soc. Amer., Ann. 31: 302-303. —Gregg, 1963. Ants of Colo., pp. 675, 677. —Smith, 1965. U. S. Dept. Agr., Tech. Bul. 1326, pp. 73-74 (economic importance).

**subbarbatus** Emery, N. Y. s. to N. C. w. to Mich., Iowa, Kans. Ecology: Nests are in plant cavities, in twigs and branches, and under bark.

*Camponotus (Camponotus) marginatus subbarbatus* Emery, 1893. Zool.

Jahrb., Abt. f. System. 7: 669, 676. ♀, ♀, ♂.

*Camponotus (Camponotus) marginatus subbarbatus* var. *paucipilis* Emery, 1893. Zool.

Jahrb., Abt. f. System. 7: 669, 677. ♀, ♂.

Taxonomy: Wheeler, 1910. N. Y. Ent. Soc., Jour. 18: 222, 229. —Wheeler, 1910. N. Y. Acad.

Sci., Ann. 20: 300. —Buren, 1944. Iowa State Col., Jour. Sci. 18: 293.

Biology: Wesson and Wesson, 1940. Amer. Midland Nat. 24: 90, 103.

### Genus CAMPONOTUS Subgenus COLOBOPSIS Mayr

*Colobopsis* Mayr, 1861. Die Europäischen Formiciden, pp. 25, 38.

Type-species: *Formica truncata* Spinola. Desig. by Bingham, 1903.

Ants of this subgenus are most abundant in the southern portions of the United States. They make their nests in hollow twigs or branches of trees and shrubs, in insect galls and nuts. The soldiers and females have a peculiar cylindrical, truncated head which the soldiers use for blocking the single entrance hole to the nest.

Revision: Wheeler, 1904. Amer. Mus. Nat. Hist., Bul. 20: 139-158.

Taxonomy: Wheeler and Wheeler 1953. Ent. Soc. Amer., Ann. 46: 188 (larvae).

**etiolatus** Wheeler. Tex.; Mexico. Ecology: Nests have been found in insect galls and in twigs of trees.

*Camponotus (Colobopsis) abditus* var. *etiolatus* Wheeler, 1904. Amer. Mus. Nat. Hist., Bul. 20: 150. ♀, 2, ♀, ♂.

Taxonomy: Wheeler, 1934. Harvard Univ., Mus. Comp. Zool., Bul. 77: 216. —Wheeler and Wheeler, 1970. Ent. Soc. Amer., Ann. 63: 650 (larva).

Biology: Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 352-353.

**hunteri** Wheeler. Tex. (Victoria). Ecology: Type series taken from twig of a pecan.

*Camponotus (Colobopsis) pylartes* var. *hunteri* Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 301, 353. ♀, 2.

Biology: Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 562.

**impressus** (Roger). Md. s. to Fla. w. to cent. Tex. Ecology: Colonies have been found in culms of sedges.

*Colobopsis impressa* Roger, 1863. Berlin. Ent. Ztschr. 7: 160. ♀.

Taxonomy: Wheeler, 1904. Amer. Mus. Nat. Hist., Bul. 20: 144-146 (each caste). —Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 302. —Smith, 1955. Brooklyn Ent. Soc., Bul. 50: 98.

Biology: Wheeler, 1932. N. Y. Ent. Soc., Jour. 40: 16.

**mississippiensis** Smith. Md. s. to Fla. w. to Ill., Okla., La.

*Camponotus (Colobopsis) mississippiensis* Smith, 1923. Psyche 30: 83. ♀, 2.

Taxonomy: Wheeler and Wheeler, 1953. Ent. Soc. Amer., Ann. 46: 188-190 (larva).

Biology: Smith, 1923. Ent. News 35: 127. —Dennis, 1938. Ent. Soc. Amer., Ann. 31: 303, 306.

**obliquus** Smith. Ala., Miss. Ecology: Found nesting in a hickory nut.

*Camponotus (Colobopsis) obliquus* Smith, 1930. Ent. Soc. Amer., Ann. 23: 256. 2.

Biology: Smith, 1931. Ent. News 42: 23.

**papago** Creighton. Ariz.; Mexico.

*Camponotus (Colobopsis) papago* Creighton, 1952. Psyche 59: 153-162. ♀, 2, ♀, ♂.

**pylartes fraxinicola** Smith. N. C. to Ala. w. to Ark.

*Camponotus (Colobopsis) pylartes fraxinicola* Smith, 1923. Psyche 30: 86. ♀, 2.

Biology: Smith, 1924. Ent. News 35: 127.

**pylartes** *pylartes* Wheeler. La., Tex. Ecology: Colonies found in twigs and spines of trees and shrubs.

*Camponotus (Colobopsis) pylartes* Wheeler, 1904. Amer. Mus. Nat. Hist., Bul. 20: 147. ♀, 24, ♀.

Taxonomy: Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21: 120. —Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 301.

Biology: Wheeler, 1904. Amer. Mus. Nat. Hist., Bul. 20: 153-158.

#### Genus CAMPONOTUS Subgenus MYRMAPHAENUS Emery

*Myrmaphaenus* Emery, 1920. Rev. Zool. Bot. Africaines 8: 237.

Type-species: *Camponotus leydigi* Forel. Orig. desig.

*Paracolobopsis* Emery, 1920. Rev. Zool. Bot. Africaines 8: 249.

Type-species: *Camponotus salvini* Forel. Orig. desig.

*Neomyrmamblys* Wheeler, 1921. Psyche 28: 19.

Type-species: *Camponotus fastigatus* Roger. Desig. by Santschi, 1921.

Only two species of this Neotropical subgenus reach the United States.

**ulcerosus** Wheeler. Tex., Ariz.; Mexico. Ecology: Nests are constructed in the soil beneath stones. A carton shield is constructed at the nest entrance with an opening the same size as the head of the major worker. Thus, the major worker functions as a door in this opening.

*Camponotus (Camponotus) ulcerosus* Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 351. ♀.

*Camponotus (Camponotus) bruesi* Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 299, 349. ♀.

Taxonomy: Creighton, 1951. Psyche 58: 47-64 (also biology).

Biology: Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 562. —Creighton, 1953. Psyche 60: 82-84. —Samuelson, 1961. Pan-Pacific Ent. 37: 189 (association with larvae of *Strymon melinus*).

**yogi** Wheeler. S. Calif. Ecology: Most colonies have been found in living stems of *Haplopappus pinifolius* where they live in burrows made by buprestids.

*Camponotus yogi* Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34: 420. ♀.

Taxonomy: Wheeler and Wheeler, 1970. Ent. Soc. Amer., Ann. 63: 650 (larva). —Creighton and Snelling, 1966. Psyche 73: 187-195 (female, male; biological notes).

Biology: Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 562. —Mallis, 1941. South. Calif. Acad. Sci., Bul. 40: 92.

#### Genus CAMPONOTUS Subgenus MYRMOBRACHYS Forel

*Myrmobrachys* Forel, 1912. Soc. Ent. de Belg., Mem. 20: 91.

Type-species: *Formica senex* Smith. Desig. by Wheeler, 1913.

This Neotropical subgenus extends into Florida, Texas, and Arizona. The species found in the United States usually nest under bark of trees, in branches of trees and shrubs, and in logs and stumps.

**mina** Forel. S. Ariz.; Mexico. Ecology: Most colonies have been found nesting in mesquite.

*Camponotus Mina* Forel, 1879. Soc. Vaud. des Sci. Nat., Bul. 16: 83. ♀.

*Camponotus erythropus* Pergande, 1894. Calif. Acad. Sci., Proc. 4: 28. ♀.

*Camponotus (Camponotus) mina zuni* Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 300. ♀.

Taxonomy: Creighton, 1965. Amer. Mus. Novitates 2239: 1-7 (also biological notes).

**planatus** Roger. S. Fla., S. Tex.; W. Indies, Mexico. Ecology: Arboreal, nesting in branches and under bark.

*Camponotus planatus* Roger, 1863. Berlin. Ent. Ztschr. 7: 148. ♀, ♀, ♂.

Taxonomy: Wheeler, 1910. N. Y. Acad. Sci., Ann. 20: 301, 348-349. —Wheeler and Wheeler, 1953. Ent. Soc. Amer., Ann. 46: 194 (larva).

- Biology: Wheeler, 1932. N. Y. Ent. Soc., Jour. 40: 15. —Wheeler, 1942. Harvard Univ., Mus. Comp. Zool., Bul. 90: 258.
- trepidulus** Creighton. S. Ariz. (Baboquivari Mtns.). Ecology: Colonies were found in dead limbs of *Quercus oblongifolia*.
- Camponotus (Myrmobrachys) trepidulus* Creighton, 1965. Amer. Mus. Novitates 2239: 7-9.
- ♀, ♂, ♀, ♂.

## TRIBE LASIINI

## Genus LASIUS Fabricius

Ants of this holarctic genus nest in exposed soil, under objects or in rotting wood. Colonies are small to moderate in size. Workers attend and may foster honeydew-excreting insects. The treatment here follows the revision by Wilson (1955).

Revision: Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 637-639. —Wheeler, 1916. Psyche 23: 168-173. —Wilson, 1955. Harvard Univ., Mus. Comp. Zool., Bul. 113: 1-199.

Taxonomy: Wheeler and Wheeler, 1953. Ent. Soc. Amer., Ann. 46: 147-150 (larvae).

Biology: Kownoski, 1959. Insectes Sociaux 6: 145-146 (flight comparisons). —Pontin, 1961. Jour. Animal Ecology 30: 47-54 (population stabilization and competition between *L. flavus* and *L. niger*). —Pontin, 1963. Jour. Animal Ecology 32: 565-567 (competition and ecology of *L. flavus* and *L. niger*).

Morphology: Bernardi, et al., 1967. Tetrahedron Letters 40: 3893-3896 (components of secretion of mandibular glands).

## Genus LASIUS Subgenus LASIUS Fabricius

*Lasius* Fabricius, 1805. Systema Piezatorum, p. 415.

Type-species: *Formica nigra* Linnaeus. Desig. by Bingham, 1903.

*Donisthorpea* Morice and Durrant, 1914. Ent. Soc. London, Trans., pp. 421-423.

Type-species: *Formica nigra* Linnaeus. Orig. desig.

**alienus** (Foerster). N. S., N. B. s. to Fla. w. to Man. N. Dak., S. Dak., Neb., Kans., Ark., Miss.; B. C., Mont., Idaho, Wash., Oreg., Calif., S. Ariz.; Mexico; Eurasia. Ecology: In N. Amer., this ant shows a preference for well-shaded woodlands where it nests in rotting logs and stumps or under stones. Only occasionally has it been found in open areas. In the early American literature, this species has been recorded as *americanus* Emery, and *alienus* has commonly been confused with *neoniger*. A frequent house pest. Cornfield ant is the approved common name for *alienus*.

*Formica aliena* Foerster, 1850. Hym. Studien 1: 36-38. ♀, ♂.

*Prenolepis lasioides* Emery, 1869. Accad. Natur. Napoli, Ann. 2: 6-7. ♀, ♀, ♂.

*Prenolepis fuscata* Emery, 1869. Accad. Natur. Napoli, Ann. 2: 8. ♀.

*Lasius fumatus* Emery, 1870. Soc. Ent. Ital., Bol. 2: 194.

*Lasius niger* var. *americanus* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 639. ♀, ♀, ♂.

*Lasius niger* var. *grandis* Forel, 1909. Soc. Ent. de Belg., Ann. 53: 104-105. ♀.

*Lasius niger alienus* var. *alieno-americanus* Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 525-526. ♀.

*Lasius niger turcicus* Santschi, 1921. Soc. Esp. Hist. Nat., Bol. 21: 115-116. ♀ (♀ misdet.).

*Lasius niger lasioides* var. *barbara* Santschi, 1921. Soc. Esp. Hist. Nat., Bol. 21: 170. ♀.

*Acanthomyops niger alienus* var. *flavidus* Kuznetsov-Ugamskij, 1927. Rev. Russ. d'Ent. 21: 189. ♀.

*Acanthomyops niger alienus* var. *turkmenus* Kuznetsov-Ugamskij, 1927. Rev. Russ. d'Ent. 21: 189. ♀.

*Lasius brunneus* var. *obscurata* Stitz, 1930. Mitt. Zool. Mus. Berlin 16: 239-240. ♀, ♀.

*Lasius alienus illyricus* Zimmermann, 1934. Zool.-Bot. Gesell. Wien, Verh. 84: 50-52. ♀, ♀, ♂.

*Lasius alienus* var. *pannonica* Roszler, 1942. Siebenburgischer Verh. Naturw., Hermannstadt, Verh. und Mitt. 91-92: 40. ♀, ♀.

*Lasius alienus* var. *pontica* Starcke, 1944. Ent. Ber. 11: 156-157. ♀.

Taxonomy: Gregg, 1945. Ent. Soc. Amer., Ann. 38: 529-546. —Wheeler and Wheeler, 1953. Ent. Soc. Amer., Ann. 46: 147-148 (larva).

Biology: Wilson, 1955. Harvard Univ., Mus. Comp. Zool., Bul. 113: 77-89. —Benjamin, 1958. Canad. Ent. 90: 419. —Kannowski, 1959. Insectes Sociaux 6: 135-136. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 178-179. —Gregg, 1963. Ants of Colo., pp. 454-457. —Burns, 1964. Ent. Soc. Amer., Ann. 57: 138 (association with tuliptree scale). —Smith, 1965. U. S. Dept. Agr., Tech. Bul. 1326, pp. 80-81 (economic importance). —Wheeler and Wheeler, 1973. Ants of Deep Canyon, pp. 115-116.

Morphology: Regnier and Wilson, 1969. Jour. Ins. Physiology 15: 893-898 (alarm-defense system).

**crypticus** Wilson. N. Dak. s. to N. Mex. w. to Alta., Idaho, Oreg., Utah; S. Calif. Ecology: Abundant in prairie regions where it nests under stones or occasionally in crater nests in soil.

*Lasius (Lasius) crypticus* Wilson, 1955. Harvard Univ., Mus. Comp. Zool., Bul. 113: 104-118. ♀, ♂, ♂.

Biology: Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 179-182.

**neoniger** Emery. Que., Maine s. to Fla. w. to Idaho, Wyo., Colo., N. Mex.; Calif. (Sierras); Alaska (?). Ecology: Nests almost exclusively in open areas, either under stones or in crater nests. One of the dominant ants found in lawns, cultivated fields, grassy road strips, and prairies. A common house and lawn pest and also fosters honeydew-excreting insects. In American literature, *neoniger* has often been confused with *alienus* (= *americanus* Emery), and many early references applying these names are here referred to *neoniger*.

*Lasius niger* var. *neoniger* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 637. ♀.

Taxonomy: Gregg, 1945. Ent. Soc. Amer., Ann. 38: 534.

Biology: Forbes, 1894. 18th Rpt. State Ent. Ill., 171 pp. —Forbes, 1908. Ill. Agr. Expt. Sta. Bul. 131: 31-44. —Tanquary, 1913. Ill. State Lab., Nat. Hist. Bul. 9: 417-443. —Metcalf and Flint, 1939. Destructive and Useful Insects, pp. 371-374, 770. —Severin, 1920. S. Dak. State Ent. Cir. 20: 3. —Talbot, 1945. Amer. Midland Nat. 34: 504-506. —Talbot, 1946. Ecology 27: 65-70. —Schread and Chapman, 1948. Conn. (State) Agr. Expt. Sta. Bul. 515: 4-11.

—Talbot, 1953. Mich. Univ., Lab. Vertebrate Biol., Contrib. No. 63, pp. 3-12. —Wilson, 1955. Harvard Univ., Mus. Comp. Zool., Bul. 113: 100-104. —Ayre, 1962. Canad. Jour. Zool. 40: 157-164 (parasitism). —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 182-185.

—Gregg, 1963. Ants of Colo., pp. 461-465. —Smith, 1965. U. S. Dept. Agr., Tech. Bul. 1326, pp. 81-84 (economic importance).

**niger** (Linnaeus). Colo., N. Mex., Ariz., Utah, Mont., Idaho, Wash., Oreg., Calif.; Mexico;

Eurasia. Ecology: Found in forests or in open situations where it usually nests under stones, though occasionally in rotting wood.

*Formica nigra* Linnaeus, 1758. Syst. Nat., Ed. 10, 1: 580. ♀.

*Lasius niger* var. *alieno-niger* Forel, 1874. Les Fourmis de la Suisse, pp. 47, 49. ♀, ♂.

*Lasius niger* var. *alienoides* Emery, 1891. Explor. Sci. Tunisie, Paris, p. 16. ♀.

*Lasius niger flavescens* Forel, 1903. Mus. Zool. Acad. Imp. Sci. St. Petersburg, Ann. 8: 386-387. ♀.

*Lasius niger emeryi* Ruzsky, 1905. Schrift. Naturforsch.-Ges. Univ. Kasan 38: 313-314. ♀.

*Acanthomyops niger nitidus* Kuznetsov-Ugamskij, 1927. Rev. Russ. d'Ent. 21: 188. ♀.

*Acanthomyops niger alienus* var. *pilicornis* Kuznetsov-Ugamskij, 1927. Rev. Russe d'Ent. 21: 189. ♀.

*Acanthomyops niger* var. *minus* Kuznetsov-Ugamskij, 1928. Ants of South Ussuri Region, U. S. S. R. Natl. Geog. Soc. Publ., p. 20. ♀.

*Lasius emarginatus* var. *nigrescens* Stitz, 1930. Mitt. Zool. Mus. Berlin 16: 240. ♀.

*Lasius niger coloratus* Santschi, 1937. Soc. Ent. de Belg., Bul. 68: 387. ♀, ♂.

*Lasius emarginatus* var. *japonicus* Santschi, 1941. Mitt. Schweiz. Ent. Ges., 18: 277-278. ♀, ♂.

*Lasius transylvanica* Roszler, 1943. Zool. Anz. 144: 44-46. ♀, ♂.

Taxonomy: Wheeler and Wheeler, 1953. Ent. Soc. Amer., Ann. 46: 148-150 (larva).



- Biology: Goswald, 1932. Ztschr. Wiss. Zool. 142: 1-156 (in Germany). —Wilson, 1955. Harvard Univ., Mus. Comp. Zool., Bul. 113: 72-75. —Wheeler and Wheeler, 1973. Ants of Deep Canyon, pp. 116-117.
- pallitarsis** (Provancher). N. S., Que. w. to B. C., Alaska s. to N. Y., N. C., Mich., Wis., Minn., S. Dak., N. Mex., Ariz., Nev., Calif.; Siberia. Ecology: Found mostly in forested areas where it nests in rotting logs and stumps or under stones. Occasionally a house infesting ant.
- Formica pallitarsis* Provancher, 1881. Nat. Canad. 12: 355. ♀, ♂.
- Lasius niger sitkaensis* Pergande, 1900. Wash. Acad. Sci., Proc. 2: 519. ♀.
- Taxonomy: Wheeler, 1917. Harvard Univ., Mus. Comp. Zool., Bul. 61: 18, 21. —Cole, 1942. Amer. Midland Nat. 28: 374. —Francoeur and Beique, 1966. Canad. Ent. 98: 144 (Provancher types).
- Biology: Wheeler, 1915. Psyche 22: 206. —Wilson, 1955. Harvard Univ., Mus. Comp. Zool., Bul. 113: 45-47. —Medler, 1958. Ent. Soc. Wash., Proc. 60: 258 (flights). —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 185-188. —Gregg, 1963. Ants of Colo., pp. 461-465. —Corbet and Ayre, 1968. Canad. Field-Nat. 82: 230-231 (swarming and mating). —Kannowski, 1969. Canad. Field-Nat. 83: 283-285 (nuptial flights). —Corbet and Ayre, 1969. Canad. Field-Nat. 83: 285-286 (swarming and mating). —Akre and Hill, 1973. Kans. Ent. Soc., Jour. 46: 526-536 (behavior of a myrmecophilous beetle).
- Morphology: Hung, 1969. Ent. Soc. Amer., Ann. 62: 456 (chromosome numbers).
- sitiens** Wilson. Colo., N. Mex., Ariz., Nev.; Mexico. Ecology: Found in the lower altitudinal forest belts in mountains, 7000 to 8000 feet where it nests under stones in dry open situations.
- Lasius (Lasius) sitiens* Wilson, 1955. Harvard Univ., Mus. Comp. Zool., Bul. 113: 108-111. ♀, ♀, ♂.
- Biology: Cole, 1966. Brigham Young Univ., Sci. Bul., Biol. Ser. 7: 20 (Nev. Test Site).

#### Genus LASIUS Subgenus CAUTOLASIUS Wilson

- Lasius* subg. *Cautolasius* Wilson, 1955. Harvard Univ., Mus. Comp. Zool., Bul. 113: 13.
- Type-species: *Formica flava* Fabricius. Orig. design.
- fallax** Wilson. Mont., Wyo., Colo., Idaho, Utah, Ariz., Wash. Ecology: Colonies have been found under stones in forest clearings.
- Lasius (Cautolasius) fallax* Wilson, 1955. Harvard Univ., Mus. Comp. Zool., Bul. 113: 130-133. ♀, ♂, ♂.
- flavus** (Fabricius). N. S., N. B., Que. s. to Ala. w. to Alta., Wash., Oreg., Calif.; Eurasia.
- Ecology: A subterranean ant which nests in various situations but most often under stones. Known to build mounds in parts of Eurasia. Workers may attend aphids on roots of grasses.
- Formica flava* Fabricius, 1781. Species Insectorum 1: 491. ♀.
- Lasius brevicornis* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 637. ♀, ♀, ♂.
- Lasius flavus myops* Forel, 1894. Soc. Vaud. des Sci. Nat., Bul. 30: 12. ♀.
- Lasius flavus myops* var. *flavoides* Forel, 1894. Soc. Vaud. des Sci. Nat., Bul. 30: 12. ♀.
- Lasius flavus* var. *fuscoides* Ruzsky, 1902. Schrift. Naturforsch. Gesell. Univ. Kasan 38: 281.
- Lasius flavus* var. *odoratus* Ruzsky, 1902. Schrift. Naturforsch. Gesell. Univ. Kasan 38: 282-283. ♀.
- Lasius flavus* var. *flavo-myops* Forel, 1915. Mitt. Schweiz. Ent. Gesell. 12: 52.
- Lasius (Formicina) brevicornis microps* Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 526. ♀.
- Lasius (Formicina) flavus claripennis* Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 527. ♀, ♀, ♂.
- Formicina flava* var. *morbosa* Bondroit, 1918. Soc. Ent. de France, Ann. 87: 28-29. ♀, ♀.
- Lasius umbratus* var. *apennina* Menozzi, 1924. Atti Soc. Nat. Mat. Modena 8: 15. ♀.
- Lasius umbratus ibericus* Santschi, 1925. Eos 1: 349-350. ♀.
- Lasius umbratus ibericus* var. *sancho* Santschi, 1925. Eos 1: 350. ♀.
- Lasius flavus* var. *olivacea* Karawajew, 1926. Konowia 5: 194. ♀.

*Lasius (Chthonolasius) helveolus* Cook, 1950. Ants of Calif., p. 327. ♀.

*Lasius (Chthonolasius) helvus* Cook, 1950. Ants of Calif., p. 326. ♀. In figs.

Taxonomy: Cole, 1940. Amer. Midland Nat. 24: 68-69. —Buren, 1944. Iowa State Col., Jour. Sci. 18: 296. —Wheeler and Wheeler, 1953. Ent. Soc. Amer., Ann. 46: 152-154 (larva). —Wheeler and Wheeler, 1970. Ent. Soc. Amer., Ann. 63: 651 (larva).

Biology: Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21: 396. —Goswald, 1932. Ztschr. Wiss. Zool. 142: 1-156 (in Germany). —Wesson and Wesson, 1940. Amer. Midland Nat. 24: 100. —Cole, 1942. Amer. Midland Nat. 28: 375. —Wheeler and Wheeler, 1944. N. Dak. Hist. Quart. 11: 253. —Wilson, 1955. Harvard Univ., Mus. Comp. Zool., Bul. 113: 126-128. —Waloff, 1957. Insectes Sociaux 4: 391-408 (effect of number of queens on their survival and the development of first brood). —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 189-191. —Gregg, 1963. Ants of Colo., pp. 465-469. —Marikovsky, 1965. Insectes Sociaux 12: 63. —Wheeler and Wheeler, 1973. Ants of Deep Canyon, p. 117.

**nearcticus** Wheeler. Que., Ont. s. to N. C., Tenn. w. to S. Dak., Wyo., Colo. Ecology:

Subterranean; prefers dense, moist woodlands here it nests in soil under rocks or fallen logs.

*Formica mellea* Provancher, 1881. Nat. Canad. 12: 356. ♀. Preocc. by Say, 1836.

*Lasius flavus nearcticus* Wheeler, 1906. Psyche 13: 38. ♀.

Taxonomy: Cole, 1940. Amer. Midland Nat. 24: 68, 70. —Buren, 1944. Iowa State Col., Jour. Sci. 18: 296, 297. —Wheeler and Wheeler, 1953. Ent. Soc. Amer., Ann. 46: 151-152 (larva). —Francoeur and Beique, 1966. Canad. Ent. 98: 144 (Provancher types).

Biology: Wesson and Wesson, 1940. Amer. Midland Nat. 24: 100. —Headley, 1943. Ohio Jour. Sci. 43: 29. —Hicks, 1947. Canad. Ent. 79: 170-171 (unusual nesting site). —Wilson, 1955. Harvard Univ., Mus. Comp. Zool., Bul. 113: 135-136. —Gregg, 1963. Ants of Colo., pp. 469-471.

### Genus LASIUS Subgenus CHTHONOLASIUS Ruzsky

*Chthonolasius* Ruzsky, 1913. Arch. f. Naturgesch. 79: 59-61.

Type-species: *Formica umbrata* Nylander. Desig. by Emery, 1925.

Ants of this subgenus are more subterranean than those of the subgenus *Lasius*, and some build large earthen mounds. Food is largely honeydew derived from subterranean plant lice and mealybugs. Some forms are temporary parasites on ants of the subgenus *Lasius*.

**atopus** Cole. Calif. (3 mi. S. Leggett, Mendocino Co.). Ecology: The nest was found in dry soil under a stone in an unshaded area.

*Lasius (Chthonolasius) atopus* Cole, 1958. Tenn. Acad. Sci., Jour. 33: 75-77. ♀.

**humilis** Wheeler. Colo., N. Mex., Nev. Ecology: Colonies were found under stones in moist soil of a meadow and in moist open woods.

*Lasius (Formicina) humilis* Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 528. ♀, ♀.

Biology: Gregg, 1963. Ants of Colo., pp. 473-475.

**minutus** Emery. N. S., Maine s. to Va. w. to Minn., Iowa. Ecology: Most often found in sphagnum bogs, swampy meadows, or open dry forests. Taken most often in mounds or masonry domes. Some specimens have been associated with *L. alienus*.

*Lasius umbratus minutus* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 37, 641. ♀, ♀, ♂.

Taxonomy: Wheeler, 1910. Psyche 17: 237, 238, 241-242.

Biology: Gaige, 1914. Univ. Mich., Mus. Zool., Occas. Papers 5: 3, 4, 21, 23. —Wheeler, 1915.

Psyche 22: 206. —Morris, 1943. Ind. Acad. Sci., Proc. 52: 215. —Wilson, 1955. Harvard Univ., Mus. Comp. Zool., Bul. 113: 182. —Kannowski, 1959. Insectes Sociaux 6: 136-138, 151-153 (colony founding; possible parasitism on *Lasius alienus* and *L. pallitarsis* (= *sitkaensis*)). —Kannowski, 1959. Ecology 40: 162-165 (radioactive phosphorus in study of colony distribution)

- nevadensis** Cole. Nev. (Kyle Canyon, Charleston Mts.). Ecology: Nests were found in an unshaded area in open forests; some were under stones and some were in exposed soil with a scattering of soil around the entrance.
- Lasius (Chthonolasius) nevadensis* Cole, 1956. Tenn. Acad. Sci., Jour. 31: 26-27. ♀, ♀, ♂.
- speculiventris** Emery. N. J., Pa. w. to Minn., Iowa, Kans. Ecology: Nests have been found under rocks and in rotting wood either in pastures or wooded areas.
- Lasius speculiventris* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 637, 641. ♀, ♂.
- Taxonomy: Wheeler, 1910. Psyche 17: 237, 242-243. —Wheeler, 1917. Conn. State Geol. and Nat. Hist. Survey Bul. 22: 592.
- Biology: Wilson, 1955. Harvard Univ., Mus. Comp. Zool., Bul. 113: 173. —Kannowski, 1959. Insectes Sociaux 6: 138-141, 153-154 (parasitism on *minutus* and possible other *Lasius* spp.).
- subumbratus** Viereck. N. S., Maine w. to Sask., Wash., Oreg., s. to N. Mex., Ariz., Nev. Ecology: Nests under stones or rotting logs in meadows and forests. A temporary social parasite. Host: *Lasius pallitarsis* (Provancher).
- Lasius umbratus subumbratus* Viereck, 1903. Amer. Ent. Soc., Trans. 29: 73. ♀.
- Taxonomy: Wheeler, 1910. Psyche 17: 237-239. —Cole, 1942. Amer. Midland Nat. 28: 374.
- Biology: Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 528. —Wheeler, 1917. Psyche 24: 167-176. —Wilson, 1955. Harvard Univ., Mus. Comp. Zool., Bul. 113: 179-180. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 191-192. —Gregg, 1963. Ants of Colo., pp. 475-478.
- umbratus** (Nylander). N. S., N. B., Que. s. to Fla. w. to Idaho, Utah, Ariz.; Eurasia. Ecology: Prefers moist soil and most commonly nests under stones and in or under rotting logs and stumps. May foster subterranean plant lice and mealybugs; occasionally a house-infesting ant. A temporary social parasite. Host: *Lasius alienus* (Foerster), *L. niger* (L.), *L. neoniger* Emery (?).
- Formica umbrata* Nylander, 1846. Acta. Soc. Sci. Fenn. 2: 1048-1050. ♀, ♂.
- Formica mixta* Nylander, 1846. Acta. Soc. Sci. Fenn. 2: 1050-1052. ♀.
- Formica affinis* Schenck, 1852. Jahrb. Ver. Nat. Nassau 8: 62-63. ♀, ♀, ♂.
- Formica aphidicola* Walsh, 1862. Ent. Soc. Phila., Proc. 1: 310. ♀, ♂.
- Lasius umbratus* var. *mixto-umbratus* Forel, 1874. Nouv. Mem. Soc. Helv. Sci. Nat., p. 48. ♀.
- Lasius umbratus* var. *exacutus* Ruzsky, 1904. Kasan Univ. Obschchestvo estestvoispytatelei Protokoly Zasedanii, no. 206, p. 15. ♀.
- Lasius umbratus* var. *mixto-affinis* Ruzsky, 1904. Kasan Univ. Obschchestvo estestvoispytatelei Protokoly Zasedanii, no. 206, p. 15. Nomen nudum.
- Lasius umbratus* var. *mixto-bicornis* Ruzsky, 1905. Schrift. Naturforsch. Gesell. Univ. Kasan 38: 292. Nomen nudum.
- Lasius umbratus* var. *affino-umbratus* Donisthorpe, 1914. Ent. Rec. 26: 40. ♀.
- Lasius umbratus* var. *przewalskii* Ruzsky, 1915. Mus. Zool. Acad. Sci. Petrograd 20: 434. ♀.
- Formicina umbrata distinguenda* Emery, 1916. Rend. Accad. Bologna, pp. 64-65. ♀, ♀.
- Formicina umbrata* var. *hybrida* Emery, 1916. Rend. Accad. Bologna, p. 66.
- Formicina umbrata* var. *nuda* Bondroit, 1917. Soc. Ent. de France, Bul. 86: 176.
- Formicina umbrata* var. *sabularum* Bondroit, 1918. Soc. Ent. de France, Bul. 87: 31.
- Formicina belgarum* Bondroit, 1918. Soc. Ent. de France, Bul. 87: 31. ♀, ♀.
- Lasius bicornis* var. *citrina* Emery, 1922. Soc. Ent. Ital., Bol. 54: 12. ♀.
- Lasius umbratus* var. *viehmeyeri* Emery, 1922. Soc. Ent. Ital., Bol. 54: 13-15. ♀, ♀.
- Lasius silvestrii* Wheeler, 1928. Lab. Zool. Portici, Bol. 20: 120-121. ♀.
- Lasius viehmeyeri* var. *dalmatica* Starcke, 1937. Tijdschr. Ent. 80: 53-54. ♀.
- Lasius umbratus* var. *hirtiscapus* Starcke, 1937. Tijdschr. Ent. 80: 43. ♀.
- Lasius umbratus distinguendus* var. *cereomicans* Starcke, 1937. Tijdschr. Ent. 80: 48-49. ♀, ♀, ♂.
- Lasius silvestri* (!) var. *osakana* Santschi, 1941. Mitt. Schweiz. Ent. Ges. 18: 278. ♀.
- Chthonolasius* (!) *affinis* var. *nyaradi* Roszler, 1943. Zool. Anz. 144: 47-48. ♀, ♀.
- Lasius umbratus epinotalis* Buren, 1944. Iowa State Col., Jour. Sci. 18: 296, 297. ♀.

Taxonomy: Wheeler, 1910. *Psyche* 17: 237-241. —Wheeler, 1917. *Conn. State Geol. and Nat. Hist. Survey Bul.* 22: 592. —Wheeler and Wheeler, 1953. *Ent. Soc. Amer., Ann.* 46: 150-151 (larva).

Biology: Wheeler, 1905. *Amer. Mus. Nat. Hist., Bul.* 21: 397. —Smith, 1928. *Ent. News* 39: 277-278. —Wesson and Wesson, 1940. *Amer. Midland Nat.* 24: 90, 101. —Wilson, 1955. *Harvard Univ., Mus. Comp. Zool., Bul.* 113: 161-165. —Kannowski, 1959. *Insectes Sociaux* 6: 141, 154-155 (possible parasitism on other *Lasius* spp.). —Wheeler and Wheeler, 1963. *Ants of N. Dak.*, pp. 192-194. —Gregg, 1963. *Ants of Colo.*, pp. 478-481. —Smith, 1965. *U. S. Dept. Agr., Tech. Bul.* 1326, pp. 84-86 (economic importance).

Morphology: Blum, *et. al.*, 1968. *Ent. Soc. Amer., Ann.* 61: 1354-1359 (terpenes in mandibular glands). —Hung, 1969. *Ent. Soc. Amer., Ann.* 62: 456 (chromosome number).

vestitus Wheeler. B. C., Idaho, Oreg., Calif.

*Lasius umbratus vestitus* Wheeler, 1910. *Psyche* 17: 238, 242. ♀.

*Lasius (Chthonolasius) pilosus* Smith, 1934. *Ent. Soc. Amer., Ann.* 27: 384. ♂.

Biology: Wilson, 1955. *Harvard Univ., Mus. Comp. Zool., Bul.* 113: 173-175.

### Genus ACANTHOMYOPS Mayr

*Acanthomyops* Mayr, 1862. *Zool.-Bot. Gesell. Wien, Verh.* 12: 699.

Type-species: *Formica clavigera* Roger. Monotypic.

The ants of this exclusively North American genus nest in the soil, usually beneath objects, and also in rotting logs and stumps. They are mostly subterranean in habit. The females and workers have a characteristic citronella or lemon-verbena odor. Species of *Acanthomyops* are sometimes of economic importance because they foster honeydew excreting insects and because of their objectionable habit of nesting around foundations of buildings and beneath basement floors. The winged forms are often mistaken for termites.

Revision: Emery, 1893. *Zool. Jahrb., Abt. f. System.* 7: 638, 642. —Wheeler, 1916. *Psyche* 23: 170-172. —Buren, 1950. *Ent. Soc. Wash., Proc.* 52: 184-190. —Wing, 1968. *Cornell Univ., Agr. Expt. Sta., Mem.* 405, 173 pp. (also biological notes for each species).

Taxonomy: Wheeler and Wheeler, 1953. *Ent. Soc. Amer., Ann.* 46: 154-156 (larvae). —Wheeler and Wheeler, 1970. *Ent. Soc. Amer., Ann.* 63: 648 (larvae).

Biology: Kannowski, 1963. *Pavia Univ., Symp. Genet. Biol. Ital.* 12: 74-102 (flight activities). —Talbot, 1963. *Ecology* 44: 549-555 (local distribution and flight activities).

arizonicus (Wheeler). S. Ariz. Ecology: Most collections have been from under stones.

*Lasius (Acanthomyops) interjectus arizonicus* Wheeler, 1917. *Amer. Acad. Arts and Sci., Proc.* 52: 532. ♀.

bureni Wing. Wis. (Comstock, Barron Co.).

*Acanthomyops bureni* Wing, 1968. *Cornell Univ., Agr. Expt. Sta., Mem.* 405, pp. 135-138. ♀, ♀, ♂.

californicus (Wheeler). S. Calif. Ecology: Colonies have been found in soil under stones.

*Lasius (Acanthomyops) interjectus californicus* Wheeler, 1917. *Amer. Acad. Arts and Sci., Proc.* 52: 531. ♀, ♀.

claviger (Roger). Mass., Ont., N. Y. s. to Fla. w. to Minn., Nebr., Kans., Miss. Ecology: Found in woodlands, pastures, or open fields where they nest under stones, in rotting wood, and occasionally in exposed soil. A common house pest. Smaller yellow ant.

*Formica clavigera* Roger, 1862. *Berlin. Ent. Ztschr.* 6: 241. ♀.

*Lasius (Acanthomyops) parvula* Smith, 1934. *Psyche* 41: 213. ♂.

Taxonomy: Buren, 1944. *Iowa State Col., Jour. Sci.* 18: 296. —Wheeler and Wheeler, 1953. *Ent. Soc. Amer., Ann.* 46: 155-156 (larva).

Biology: Wheeler, 1905. *Amer. Mus. Nat. Hist., Bul.* 21: 398. —Dennis, 1938. *Ent. Soc. Amer., Ann.* 31: 296, 397. —Rau, 1945. *Ent. News* 56: 119. —Carter, 1962. *Elisha Mitchell Sci. Soc., Jour.* 78: 150-204. —Talbot, 1963. *Ecology* 44: 549-557 (local distribution, flight activities). —Smith, 1965. *U. S. Dept. Agr., Tech. Bul.* 1326, pp. 86-87 (economic importance). —Talbot, 1973. *Great Lakes Ent.* 6: 20-21 (S. Mich.).

- Morphology: Wheeler and McClendon, 1903. Biol. Bul. 4: 149-155. —Chadha, *et al.*, 1962. Jour. Ins. Physiol. 8: 175-179 (citronellal and citral in mandibular gland secretion). —Regnier and Wilson, 1968. Jour. Ins. Physiol. 14: 955-970 (alarm-defense system).
- colei** Wing. N. Mex., Ariz.  
*Acanthomyops colei* Wing, 1968. Cornell Univ., Agr. Expt. Sta., Mem. 405, pp. 88-89. ♀, ♂.
- coloradensis** (Wheeler). Man., N. Dak., S. Dak., Colo., N. Mex. w. to Alta, Oreg., Utah.  
 Ecology: Most colonies have been found under stones. Confused with *A. claviger* in earlier literature.  
*Lasius (Acanthomyops) interjectus coloradensis* Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 532. ♀, ♀, ♂.
- Biology: Gregg, 1963. Ants of Colo., pp. 481, 483-484. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 195-197 (reported as *claviger*).
- creightoni** Wing. Utah (Moab, Grand Co.).  
*Acanthomyops creightoni* Wing, 1968. Cornell Univ., Agr. Expt. Sta., Mem. 405, pp. 141-143. ♀, ♀, ♂.
- interjectus** (Mayr). Mass., N. Y. s. to Ga. w. to Mont., Idaho, Utah, N. Mex. Ecology: Found in woodlands, pastures or meadows. They may nest in exposed soil where the nest is sometimes surmounted by a mound, under stones or other objects, in rotting logs and stumps, or next to foundation walls of buildings. A frequent house pest. Larger yellow ant.  
*Lasius (Acanthomyops) interjectus* Mayr, 1866. Zool.-Bot. Gesell. Wien, Verh. 16: 888. ♀.
- Taxonomy: Wheeler, 1917. Conn. State Geol. and Nat. Hist. Survey Bul. 22: 592, 594.  
 —Buren, 1944. Iowa State Col., Jour. Sci. 18: 296. —Wheeler and Wheeler, 1953. Ent. Soc. Amer., Ann. 46: 156 (larva).
- Biology: Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21: 397-398. —Smith, 1928. Kans. Ent. Soc., Jour. 1: 14-18. —Dennis, 1938. Ent. Soc. Amer., Ann. 31: 296, 306. —Carter, 1962. Elisha Mitchell Sci. Soc., Jour. 88: 150-204. —Talbot, 1963. Ecology 44: 549-557 (local distribution, flight activities). —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 197-200. —Gregg, 1963. Ants of Colo., pp. 484-486. —Smith, 1965. U. S. Dept. Agr., Tech. Bul. 1326, pp. 88-89 (economic importance). —Talbot, 1973. Great Lakes Ent. 6: 22 (S. Mich.).
- latipes** (Walsh). Que., Maine w. to B. C. s. to S. C., Tenn., Ill., Iowa, Okla., N. Mex., Ariz., Calif.  
 Ecology: Found in open woodlands, meadows, or pastures where they may nest in exposed soil commonly surmounted by a mound, under stones or other objects, or at the base of stumps.  
*Formica latipes* Walsh, 1862. Ent. Soc. Phila., Proc. 1: 311. ♀, ♀, ♂.
- Taxonomy: Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 638, 642. —Wheeler, 1917. Conn. State Geol. and Nat. Hist. Survey Bul. 22: 592. —Buren, 1944. Iowa State Col., Jour. Sci. 18: 296. —Cole, 1954. Tenn. Acad. Sci., Jour. 29: 284. —Wing, 1968. Cornell Univ., Agr. Expt. Sta., Mem. 405, pp. 98-105 (hybrids described).
- Biology: Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21: 398. —Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 21: 398. —Mallis, 1941. South. Calif. Acad. Sci., Bul. 41: 79. —Talbot, 1963. Ecology 44: 549-557 (local distribution, flight activities). —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 200-202. —Gregg, 1963. Ants of Colo., pp. 486-488. —Smith, 1965. U. S. Dept. Agr., Tech. Bul. 1326, pp. 91-93 (economic importance). —Cole, 1966. Brigham Young Univ., Sci. Bul., Biol. Ser. 7: 20 (Nev. Test Site). —Talbot, 1973. Great Lakes Ent. 6: 22 (S. Mich.).
- Morphology: Wheeler and McClendon, 1903. Biol. Bul. 4: 149-155. —Wheeler, 1903. Amer. Mus. Nat. Hist., Bul. 41: 79.
- murphyi** (Forel). N. Y., Ont. s. to Ga. w. to Sask., Idaho, n. Calif., Utah, N. Mex. Ecology: Usually nests under or next to stones in open woodlands or edges of woodlands. Prefers sandy soil. Widely but sporadically distributed in N. Amer.  
*Lasius (Acanthomyops) murphyi* Forel, 1901. Soc. Ent. de Belg., Ann. 45: 367. ♀, ♀, ♂.  
*Lasius (Acanthomyops) murphyi* Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21: 398.  
 Emend.

- Taxonomy: Wing, 1968. Cornell Univ., Agr. Expt. Sta., Mem. 405, pp. 13-121 (hybrids described).
- Biology: Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21: 398. —Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 530. —Talbot, 1963. Ecology 44: 549-557 (local distribution, flight activities). —Gregg, 1963. Ants of Colo., pp. 489-490. —Smith, 1965. U. S. Dept. Agr., Tech. Bul. 1326, pp. 89-91 (economic importance). —Talbot, 1973. Great Lakes Ent. 6: 21 (S. Mich.).
- occidentalis** (Wheeler). Man., Minn., Nebr., Colo., N. Mex. w. to B. C., Wash., Wyo., Utah. Ecology: Nests have been found under stones in dry sandy soil.  
*Lasius (Acanthomyops) occidentalis* Wheeler, 1909. N. Y. Ent. Soc., Jour. 17: 83. ♀, ♀, ♂.
- Biology: Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 530. —Gregg, 1963. Ants of Colo., pp. 490-493.
- plumipilosus** (Buren). N. C., Mich., Minn., Iowa. Ecology: Found under stones and in rotting logs.  
*Lasius (Acanthomyops) plumipilosus* Buren, 1941. Iowa State Col., Jour. Sci. 15: 231-235. ♀, ♀, ♂.
- Biology: Buren, 1944. Iowa State Col., Jour. Sci. 18: 296, 299.
- pogonognynus** (Buren). Iowa, Colo., Idaho. Listed as a hybrid of *murphyi* x *latipes* by Wing (1968).  
*Lasius (Acanthomyops) pogonognynus* Buren, 1950. Ent. Soc. Wash., Proc. 52: 186. ♀, ♀.
- Taxonomy: Wing, 1968. Cornell Univ., Agr. Expt. Sta., Mem. 405, pp. 117-119 (as a hybrid).
- Biology: Gregg, 1963. Ants of Colo., pp. 493-494.
- pubescens** (Buren). Minn. Ecology: Nests with low mounds were found in soil in open woods.  
*Lasius (Acanthomyops) pubescens* Buren, 1942. Iowa State Col., Jour. Sci. 16: 405. ♀, ♀.
- subglaber** (Emery). Maine s. to Ga., Tenn. w. to Sask., N. Dak., S. Dak. Ecology: Nests in woodlands or open areas, in mound nests, under stones, or in or under rotting logs and stumps.  
*Lasius claviger* var. *subglaber* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 642. ♀, ♀, ♂.  
*Lasius (Acanthomyops) clavigeroides* Buren, 1942. Iowa State Col., Jour. Sci. 16: 406. ♀, ♀, ♂.
- Taxonomy: Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21: 398. —Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 533. —Wheeler and Wheeler, 1953. Ent. Soc. Amer., Ann. 46: 155 (larva). —Wing, 1968. Cornell Univ., Agr. Expt. Sta., Mem. 405, pp. 121-132 (hybrids described). —Wheeler and Wheeler, 1970. Ent. Soc. Amer., Ann. 63: 648, 649 (larva).
- Biology: Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24: 623. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 203-204. —Talbot, 1973. Great Lakes Ent. 6: 19-20 (S. Mich.).

#### Genus PARATRECHINA Motschulsky

Species of this genus often nest in the soil where the entrance may be surrounded by a small irregular crater of earth, under stones, or beneath moss. They are occasionally house pests. Because of the differences of opinion in recent literature regarding the status of subgenera, particularly *Nylanderia*, the two subgenera are listed as in previous catalogs.

#### Genus PARATRECHINA Subgenus PARATRECHINA Motschulsky

*Paratrechina* Motschulsky, 1863. Soc. Nat. Moscou, Bul. 36: 13.

Type-species: *Paratrechina currens* Motschulsky. Desig. by Wheeler, 1911.

**longicornis** (Latreille). S. C. s. to Fla. w. to Tex.; Calif.; Pantropical. Ecology: Highly adaptable and may nest in many situations such as trash, refuse, plant cavities, rotting wood, and in soil under stones. Workers are omnivorous and feed on live and dead insects, seeds, honeydew and household foods. Sometimes a household pest. Introduced into the U. S. Probably native to Africa or the Orient and spread to many parts of the world by

commerce. Sometimes found in northern states in greenhouses or other buildings. Crazy ant.

*Formica longicornis* Latreille, 1802. Hist. Nat. Fourmis, p. 113. ♀.

*Formica vagans* Jerdon, 1851. Madras Jour. Lit. Sci. 17: 124. ♀.

*Formica gracilescens* Nylander, 1856. Ann. Sci. Nat. Zool. 5: 73. ♀.

*Paratrechina currens* Motschulsky, 1863. Soc. Nat. Moscou, Bul. 36: 14. ♀.

Taxonomy: Bingham, 1903. Fauna of British India 2: 326-327 (each caste). —Smith, 1936. Puerto Rico Univ. Jour. Agr. 20: 865, 869-870. —Wheeler and Wheeler 1953. Ent. Soc. Amer., Ann. 46: 143 (larva). —Wilson and Taylor, 1967. Pacific Ins. Monog. 14: 87 (Polynesia).

Biology: Marlatt, 1928. U. S. Dept. Agr. Farmers' Bul. 740: 6-7. —Phillips, 1934. (Hawaii Univ.) Expt. Sta. Pineapple Prod. Coop. Assoc. Bul. 15: 18-19 —Turner, 1940. Conn. Agr. Expt. Sta. Bul. 434: 311-312. —Fox and Garcia-Moll, 1961. Jour. Econ. Ent. 54: 1065-1066. —Brown, 1964. Ent. News 75: 14-15. —Smith, 1965. U. S. Dept. Agr. Tech. Bul. 1326, pp. 74-76 (economic importance).

### Genus PARATRECHINA Subgenus NYLANDERIA Emery

*Nylanderia* Emery, 1906. Soc. Ent. de Belg., Anñ. 50: 134.

Type-species: *Formica vividula* Nylander. Orig. desig.

Members of this subgenus are in need of study. Existing keys are not adequate for species identification, and a number of the names may be wrongly applied. Species determination has always been considered difficult and male genitalia are believed to offer help in separating species. The segregates listed here are essentially as those proposed by Creighton, 1950. This subgenus is much better represented in the tropical regions of the world, and there are many tramp species which make the taxonomy more confusing.

Taxonomy: Creighton, 1950. Harvard Univ., Mus. Comp. Zool., Bul. 104: 402-410.

Biology: Smith, 1965. U. S. Dept. Agr. Tech. Bul. 1326, pp. 76-77 (as house pests).

**bourbonica** (Forel). S. C., Fla.; Panropical. Introduced. Probably native to tropical Asia and spread by commerce to Indian and Pacific Oceans and to New World tropics.

*Prenolepis nodifera bourbonica* Forel, 1886. Soc. Ent. de Belg., Ann. 30: 210. ♀, ♀, ♂.

Taxonomy: Creighton, 1950. Harvard Univ., Mus. Comp. Zool., Bul. 104: 405 (a var. of *bourbonica* in U. S. ?). —Wilson and Taylor, 1967. Pacific Ins. Monog. 14: 87-89 (Polynesia).

Biology: Smith, 1930. Fla. Ent. 14: 23-24. —Wheeler, 1932. N. Y. Ent. Soc., Jour. 40: 16.

**bruesii** (Wheeler). Fla., Ala. w. to Okla., Tex., Ariz. (?)

*Prenolepis bruesii* Wheeler, 1903. Psyche 10: 106. ♀, ♀, ♂.

Taxonomy: Wheeler and Wheeler, 1968. Ent. Soc. Amer., Ann. 61: 211 (larva; Okla.; as *bruesii*).

Biology: Smith, 1924. Ent. News 35: 122.

**fulva** (Mayr). S. Tex. s. to Argentina. Sporadically in greenhouses as far north as N. J.

Probably introduced. References to *P. fulva pubens* (Forel) from the U. S. pertain to this species.

*Prenolepis fulva* Mayr, 1862. Zool.-Bot. Gesell. Wien, Verh. 12: 698. ♀, ♀.

Taxonomy: Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 636-637. —Creighton, 1950. Harvard Univ., Mus. Comp. Zool., Bul. 104: 406-407.

Biology: Marlatt, 1922. U. S. Dept. Agr. Farmers' Bul. 740: 8-9.

**melandieri arenivaga** (Wheeler). N. J. s. to Fla. w. to Iowa, Tex., Calif.

*Prenolepis arenivaga* Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21: 391. ♀, ♂.

*Prenolepis (Nylanderia) arenivaga* var. *faisonensis* Forel, 1922. Rev. Suisse de Zool. 30: 98. ♀.

Taxonomy: Buren, 1944. Iowa State Col., Jour. Sci. 18: 295. —Harper, 1965. Calif. Dept. Agr. Bul., Ann. Rpt. 45, 54: 81 (Calif. records).

Biology: Smith, 1928. Ent. News 39: 278.

**melanderi melanderi** (Wheeler). Tenn. w. to Kans., Tex., Ariz.; Mexico.

*Prenolepis melanderi* Wheeler, 1903. Psyche 10: 104. ♀, ♀, ♂.

Taxonomy: Emery, 1906. Soc. Ent. de Belg., Ann. 50: 132. —Wheeler and Wheeler, 1953. Ent. Soc. Amer., Ann. 46: 144 (larva).

Biology: Mitchell and Pierce, 1912. Ent. Soc. Wash., Proc. 14: 74.

**parvula** (Mayr). Mass. s. to Fla. w. to N. Dak., Nebr., Kans., Tex., Ariz., Utah (?). Ecology:

Nests under moss, in logs and stumps, beneath stones, or in open grassy areas where the nest may be surmounted by a small crater.

*Prenolepis parvula* Mayr, 1870. Zool.-Bot. Gesell. Wien, Verh. 20: 947. ♀, ♀, ♂.

*Prenolepis (Nylanderia) parvula* var. *grandula* Forel, 1922. Rev. Suisse des Sci. Nat., Bul. 20: 348. ♀.

Taxonomy: Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 636 (worker, male). —Wesson and Wesson, 1940. Amer. Midland Nat. 24: 100. —Buren, 1944. Iowa State Col., Jour. Sci. 18: 295. —Wheeler and Wheeler, 1968. Ent. Soc. Amer., Ann. 61: 211 (larva).

Biology: Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21: 390. —Talbot, 1934. Ecology 15:

420-422. —Dennis, 1938. Ent. Soc. Amer., Ann. 31: 295, 306. —Cole, 1940. Amer. Midland Nat. 24: 66. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 175-176.

**vidula guatemalensis** (Forel). S. Ariz.; Central Amer. Possibly introduced. According to Snelling (correspondence), the Ariz. record for *guatemalensis* is based on misidentified *arenivaga*.

*Prenolepis vidula vidula* var. *guatemalensis* Forel, 1884. Soc. Vaud. des Sci. Nat., Bul. 20: 348. ♀.

Taxonomy: Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21: 392 (worker, male).

Biology: Wheeler, 1906. Amer. Mus. Nat. Hist., Bul. 22: 342. —Cole, 1934. Ent. Soc. Amer., Ann. 27: 401.

**vidula vidula** (Nylander). Fla., Miss. Sporadically in greenhouses in northern areas as far as Canada. Introduced.

*Formica vidula* Nylander, 1846. Acta Soc. Fenn. 2: 900. ♀, ♀, ♂.

*Formica perminuta* Buckley, 1866. Ent. Soc. Phila., Proc. 6: 162. ♀. Synonymy questionable.

*Formica picea* Buckley, 1866. Ent. Soc. Phila., Proc. 6: 163. ♀. Synonymy questionable.

*Formica (Tapinoma) terricola* Buckley, 1866. Ent. Soc. Phila., Proc. 6: 168. ♀, ♀, ♂. Synonymy questionable.

Taxonomy: Emery, 1906. Soc. Ent. de Belg., Ann. 50: 130 (each caste). —Emery, 1910. Deut. Ent. Ztschr., p. 131 (each caste).

Biology: Mitchell and Pierce, 1912. Ent. Soc. Wash., Proc. 14: 74. —Marlatt, 1922. U. S. Dept. Agr. Farmers' Bul. 740: 7.

### Genus PRENOLEPIS Mayr

*Prenolepis* Mayr, 1861. Die Europäischen Formiciden, pp. 26, 52.

Type-species: *Tapinoma nitens* Mayr. Desig. by Bingham, 1903.

These ants usually nest in the soil in exposed situations or under cover in small to moderate sized colonies. Workers feed on honeydew, secretions of floral and extrafloral nectaries, exudates from galls, earthworms, arthropods, and ripened or decaying fruits. The ants often invade houses in search of food, and they sometimes forage even at freezing temperatures. Repletes are common. Males and females overwinter in the nest and are among the first of ants to take their nuptial flights in the spring.

Revision: Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 635-637. —Wheeler, 1930. Ent. Soc. Amer., Ann. 23: 1-26.

Taxonomy: Wheeler and Wheeler, 1953. Ent. Soc. Amer., Ann. 46: 142 (larvae).

**imparis arizonica** Wheeler. S. Ariz.

*Prenolepis imparis* var. *arizonica* Wheeler, 1930. Ent. Soc. Amer., Ann. 23: 22. ♀, ♀, ♂.



**imparis californica** Wheeler. Oreg., Nev., Calif. Ecology: Reported to feed on succulent tissue of fruit and on fruit buds, damaging these by eating out the centers and leaving only the scales.

*Prenolepis imparis* var. *californica* Wheeler, 1930. Ent. Soc. Amer., Ann. 23: 23. ♀, ♀, ♂.

Taxonomy: Eckert and Mallis, 1937. Calif. Agr. Expt. Sta. Bul. 342: 27.

Biology: Essig, 1926. Ins. West. No. Amer., p. 866. —Mallis, 1941. South. Calif. Acad. Sci., Bul. 40: 77-78.

**imparis coloradensis** Wheeler. Colo., N. Mex.

*Prenolepis imparis* var. *coloradensis* Wheeler, 1930. Ent. Soc. Amer., Ann. 23: 22. ♀.

Biology: Gregg, 1963. Ants of Colo., pp. 496-498.

**imparis imparis** (Say). Conn., Ont. s. to Fla. w. to Wis., Iowa, Mo., Okla., Tex., N. Mex., Ariz.

An annoying house infesting ant with habits similar to those given for the genus.

*Formica imparis* Say, 1836. Boston Jour. Nat. Hist. 1: 287. ♀, ♂.

*Tapinoma polita* Smith, 1855. Ent. Soc. London, Trans. 3: 112. ♀. Synonymy questionable.

*Formica* (*Tapinoma*) *Wichita* Buckley, 1866. Ent. Soc. Phila., Proc. 6: 169. ♀. Synonymy questionable.

*Prenolepis nitens* var. *americana* Forel, 1891. In Grandidier, Hist. Madagascar, v. 20, p. 94. ♂.

*Prenolepis imparis* var. *minuta* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 636. ♀, ♂.

*Prenolepis imparis* var. *testacea* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 636. ♀, ♂.

*Prenolepis imparis* var. *pumila* Wheeler, 1930. Ent. Soc. Amer., Ann. 23: 21. ♀, ♂.

Taxonomy: Wesson and Wesson, 1940. Amer. Midland Nat. 24: 100. —Cole, 1940. Amer.

Midland Nat. 24: 66, 67. —Wheeler and Wheeler, 1953. Ent. Soc. Amer., Ann. 46: 142-143 (larva).

Biology: Smith, 1924. Ent. News 35: 122. —Smith, 1928. Ent. News 39: 278. —Dennis, 1941.

Ent. Soc. Amer., Ann. 34: 82-86. —Talbot, 1943. Ecology 24: 31-44 (population studies).

—Talbot, 1943. Ecology 24: 345-352. (response to temperature and humidity changes).

—Tarpley, 1965. N. Y. Ent. Soc., Jour. 73: 6 (nuptial flight). —Smith, 1965. U. S. Dept.

Agr., Tech. Bul. 1326, pp. 78-79 (economic importance).

### Genus MYRMECOCYSTUS Wesmael

*Myrmecocystus* Wesmael, 1838. Brussels Acad. Roy. de Belg., Bul. de Cl. des Sci. 5: 769.

Type-species: *Myrmecocystus mexicanus* Wesmael. Monotypic.

This genus is native to Mexico and western United States and is especially typical of the arid plains and deserts. The ants nest in soil, the nest being surmounted by a small crater, usually in medium-sized colonies of 1,000 to 3,000 workers. Some forms are apparently entirely predaceous or carnivorous; others live on honeydew and nectar obtained from plants or the secretion of galls. They may be diurnal or nocturnal in their activity. Repletes are known to occur in many forms. Ants of this genus are commonly called "honey ants" because of the honeylike substance stored in the gasters of the repletes. Fluid stored in repletes is largely for use by adults of the colony with little or none for the larvae. Larval food consists of dead insects brought in by foraging workers. Owing to the high degree of polymorphism in many forms, these ants are not easily determined specifically without large series of workers, especially major ones.

Since this section was completed, Snelling (1976) published a revision of *Myrmecocystus*, the results of which cannot be entirely incorporated into this catalog at this date. Snelling recognizes 27 species in three subgenera, the typical subgenus, subgenus *Endiodictes* Snelling (type-species: *Myrmecocystus melliger* Forel), and subgenus *Eremnocystus* Snelling (type-species: *Myrmecocystus creightoni* Snelling). Except for their arrangement by subgenus, all species treated by Snelling that fall within the scope of this catalog are given.

Revision: Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 666-667. —Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24: 345-397. —Wheeler, 1912. Psyche 19: 172-181. —Snelling, 1976. Nat.

Hist. Mus. of Los Angeles Co., Sci. Bul. 24: 1-163 (also biology).

Taxonomy: Snelling, 1969. Los Angeles Co. Mus., Contrib. Sci. 170: 1-9 (*melliger* complex).

—Wheeler and Wheeler, 1970. Ent. Soc. Amer., Ann. 63: 651 (larvae).

- Biology: Snelling, 1968. Los Angeles Co. Mus., Natur. Hist. Quart. 7: 14-18.
- colei** Snelling. S. Calif.  
*Myrmecocystus (Eremnocystus) colei* Snelling, 1976. Nat. Hist. Mus. of Los Angeles Co., Sci. Bul. 24: 94-97. ♀, ♀, ♂.
- creightoni** Snelling. S. Calif.  
*Myrmecocystus creightoni* Snelling, 1971. Los Angeles Co. Mus., Contrib. Sci. 214: 6-11. ♀, ♀, ♂.
- Taxonomy: Wheeler and Wheeler, 1968. Ent. Soc. Amer., Ann. 61: 213 (larva; misidentified as *M. lugubris*).
- Biology: Wheeler and Wheeler, 1973. Ants of Deep Canyon, p. 120.
- depilis** Forel. W. Tex., N. Mex., Ariz., s. Nev.; Mexico. Confused with *mimicus* in the earlier literature.  
*Myrmecocystus melliger* var. *depilis* Forel, 1901. Soc. Ent. de Belg., Ann. 45: 135. ♀.
- Taxonomy: Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24: 354. —Wheeler, 1912. Psyche 19: 173.
- ewarti** Snelling. S. Calif.  
*Myrmecocystus ewarti* Snelling, 1971. Los Angeles Co. Mus., Contrib. Sci. 214: 2-6. ♀, ♀, ♂.
- Biology: Wheeler and Wheeler, 1973. Ants of Deep Canyon, p. 120.
- flaviceps** Wheeler. Utah, Ariz., s. Nev., s. Calif.; Mexico.  
*Myrmecocystus yuma* var. *flaviceps* Wheeler, 1912. Psyche 19: 174, 177. ♀.
- Biology: Wheeler and Wheeler, 1973. Ants of Deep Canyon, pp. 121-122.
- hammettensis** Cole. Idaho, Nev., e. central Calif.  
*Myrmecocystus hammettensis* Cole, 1938. Amer. Midland Nat. 19: 678. ♀, ♀, ♂.
- kathjuli** Snelling. S. Calif.  
*Myrmecocystus (Endiodictes) kathjuli* Snelling, 1976. Nat. Hist. Mus. of Los Angeles Co., Sci. Bul. 24: 59-62. ♀, ♀, ♂.
- kennedyi** Cole. S. Idaho, s.w. Utah, Ariz., s.e. Oreg., Nev., Calif.; Mexico. This species was called *M. semirufus* in the literature prior to Snelling, 1969.  
*Myrmecocystus melliger semirufus* var. *kennedyi* Cole, 1936. Ent. News 47: 119. ♀, ♀, ♂.
- Taxonomy: Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24: 355, 368-369 (*semirufus*; also biology). —Wheeler, 1912. Psyche 19: 174, 176 (*semirufus*; also biology). —Cole, 1938. Amer. Midland Nat. 20: 371, 372. —Wheeler and Wheeler, 1968. Ent. Soc. Amer., Ann. 61: 213 (larva; as *semirufus*). —Snelling, 1969. Los Angeles Co. Mus., Contrib. Sci. 170: 6.
- Biology: Mallis, 1941. South. Calif. Acad. Sci., Bul. 40: 20 (*semirufus*). —Wheeler and Wheeler, 1973. Ants of Deep Canyon, p. 122.
- koso** Snelling. S. Nev., s. Calif.  
*Myrmecocystus (Endiodictes) koso* Snelling, 1976. Nat. Hist. Mus. of Los Angeles Co., Sci. Bul. 24: 74-78. ♀, ♀, ♂.
- lugubris** Wheeler. S. Nev., s. Calif.  
*Myrmecocystus lugubris* Wheeler, 1909. N. Y. Ent. Soc., Jour. 17: 98. ♀.
- Taxonomy: Wheeler, 1912. Psyche 19: 174, 176. —Creighton, 1956. Amer. Mus. Novitates 1807: 1.
- Biology: Cole, 1966. Brigham Young Univ., Sci. Bul., Biol. Ser. 7: 21.
- melliger** Forel. W. Tex.; Mexico. Used as food and medicine by Indians.  
*Formica melligera* Llave, 1832. Reg. Trim. o. Collect. Mem. Hist. Lit., p. 463. ♀.  
 Questionable placement.  
*Myrmecocystus melliger* Forel, 1886. Soc. Ent. de Belg., Ann. 30: 201. ♀.  
*Myrmecocystus melliger mendax* var. *comatus* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24: 352. ♀, ♀, ♂.

- Taxonomy: Wheeler, 1912. *Psyche* 19: 173, 175. —Snelling, 1969. Los Angeles Co. Mus., Contrib. Sci. 170: 4. —Wheeler and Wheeler, 1968. Ent. Soc. Amer., Ann. 61: 211-213 (larva).
- mendax** Wheeler. Tex., Colo., N. Mex., Ariz., s. Nev., s. Calif.; Mexico.  
*Myrmecocystus melliger mendax* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24: 351. ♀, ♀, ♂.  
*Myrmecocystus melliger orbiceps* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24: 349. ♀, ♀.
- Taxonomy: Wheeler, 1912. *Psyche* 19: 173. —Cole, 1954. Tenn. Acad. Sci., Jour. 29: 284. —Snelling, 1969. Los Angeles Co. Mus., Contrib. Sci. 170: 2.
- Biology: Wheeler, 1910. *Ants*, p. 376. —Cole, 1942. Amer. Midland Nat. 28: 386. —Gregg, 1963. *Ants of Colo.*, pp. 643-645, 645-648 (misident. as *comatus*, p. 643-645).
- mexicanus** Wesmael. W. Tex., Colo., N. Mex., Utah, Ariz., Nev., Calif.; Mexico.  
*Myrmecocystus mexicanus* Wesmael, 1838. Brussels Acad. Roy. de Belg., Bul. Cl. des Sci. 5: 770. ♀.  
*Myrmecocystus Melliger* var. *hortus-deorum* McCook, 1881. Acad. Nat. Sci. Phila., Proc., pp. 65, 69. ♀, replete ♀, ♀, ♂.
- Taxonomy: Forel, 1886. Soc. Ent. de Belg., Ann. 30: 202. —Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 666. —Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24: 356-360. —Wheeler, 1912. *Psyche* 19: 173, 178. —Wheeler, 1968. Ent. Soc. Amer., Ann. 61: 213 (larva).
- Biology: McCook, 1881. Acad. Nat. Sci. Phila., Proc., pp. 17-77. —McCook, 1882. The Honey Ants of the Garden of the Gods and the Occident Ants of the American Plains, pp. 17-74. —Mallis, 1941. South. Calif. Acad. Sci., Bul. 40: 81. —Gregg, 1963. *Ants of Colo.*, pp. 648-651. —Wheeler and Wheeler, 1973. *Ants of Deep Canyon*, pp. 122-124.
- mimicus** Wheeler. S.W. Kans., w. Okla., w. Tex., N. Mex., Ariz., Calif.; Mexico.  
*Myrmecocystus melliger mimicus* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24: 353. ♀, ♀, ♂.  
*Myrmecocystus melliger mimicus* var. *jesuita* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24: 354. ♀.  
*Myrmecocystus melliger lomaensis* Wheeler, 1912. *Psyche* 19: 174. ♀, replete ♀, ♀.
- Taxonomy: Creighton, 1950. Harvard Univ., Mus. Comp. Zool., Bul. 104: 446. —Wheeler and Wheeler, 1968. Ent. Soc. Amer., Ann. 61: 213 (larva).
- Biology: Cole, 1934. Ent. Soc. Amer., Ann. 27: 401-402. —Mallis, 1941. South. Calif. Acad. Sci., Bul. 40: 80. —Cole, 1966. Brigham Young Univ., Sci. Bul., Biol. Ser. 7: 22 (Nev. Test Site). —Wheeler and Wheeler, 1973. *Ants of Deep Canyon*, pp. 124-125. —Holldobler, 1976. *Science* 192: 192-194 (tournaments and slavery).
- navajo** Wheeler. Colo., w. Tex., N. Mex., Utah, Ariz., s. Nev., s. Calif.  
*Myrmecocystus mexicanus navajo* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24: 360. ♀, ♀.
- Taxonomy: Wheeler, 1912. *Psyche* 19: 173, 179.
- Biology: Cole, 1942. Amer. Midland Nat. 28: 386. —Gregg, 1963. *Ants of Colo.*, pp. 651-653. —Wheeler and Wheeler, 1973. *Ants of Deep Canyon*, p. 125.
- placodops** Forel. Tex. N. Mex., Ariz.; Mexico.  
*Myrmecocystus melliger* var. *placodops* Forel, 1908. Soc. Vaud. des Sci. Nat., Bul. 44: 70. ♀.
- Taxonomy: Wheeler, 1912. *Psyche* 19: 173. —Snelling, 1969. Los Angeles Co. Mus., Contrib. Sci. 170: 6.
- pyramicus** Smith. Idaho, s.e. Oreg., Nev.  
*Myrmecocystus pyramicus* Smith, 1951. Great Basin Nat. 11: 91-94. ♀.
- Taxonomy: Cole, 1957. N. Y. Ent. Soc., Jour. 65: 129-130 (female, male).
- romainei** Cole. W. Kans., w. Okla., w. Tex., Colo., N. Mex., Utah, Ariz., Nev.; Mexico.  
*Myrmecocystus melliger semirufus* var. *romainei* Cole, 1936. Ent. News 47: 120. ♀.

Biology: Cole, 1954. Tenn. Acad. Sci., Jour. 29: 285 (as *semirufa*, in part). —Gregg, 1963. Ants of Colo., pp. 653-655 (as *semirufus*, in part).

**semirufus** Emery. S. Calif.; Mexico.

*Myrmecocystus melliger* var. *semirufus* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 667. ♀.

Taxonomy: Snelling, 1969. Los Angeles Co. Mus., Contrib. Sci. 170: 4-6 (The species previously considered to be *M. semirufus* by Wheeler and subsequent authors must now be known as *M. kennedyi* Cole.).

Biology: Wheeler and Wheeler, 1973. Ants of Deep Canyon, pp. 125-126 (misident. as *placodops* Forel).

**tenuinodis** Snelling. S. Nev., s.w. Ariz., s. Calif.; Mexico.

*Myrmecocystus (Eremnocystus) tenuinodis* Snelling, 1976. Nat. Hist. Mus. of Los Angeles Co., Sci. Bul. 24: 107-110. ♀, ♀.

**testaceus** Emery. Idaho, Utah, Wash. Oreg., Nev., Calif.; Mexico.

*Myrmecocystus melliger* var. *testaceus* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 667. ♀.

*Myrmecocystus mexicanus mojave* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24: 360. ♀.

*Myrmecocystus mexicanus idahoensis* Cole, 1936. Ent. News 47: 118. ♀, ♀, ♂.

Taxonomy: Wheeler, 1912. Psyche 19: 173, 179-181. —Snelling, 1969. Los Angeles Co. Mus., Contrib. Sci. 170: 6. —Wheeler and Wheeler, 1968. Ent. Soc. Amer., Ann. 61: 213 (larva).

Biology: Wheeler, 1910. Ants, p. 349. —Leonard, 1911. San Diego Soc. Nat. Hist., Trans. 1: 91-92. —Cole, 1934. Ent. Soc. Amer., Ann. 27: 403. —Mallis, 1941. South. Calif. Acad. Sci., Bul. 40: 81. —Cole, 1966. Brigham Young Univ., Sci. Bul., Biol. Ser. 7: 22 (Nev. Test Site). —Wheeler and Wheeler, 1973. Ants of Deep Canyon, pp. 126-127.

**wheeleri** Snelling. S. Calif.

*Myrmecocystus wheeleri* Snelling, 1971. Los Angeles Co. Mus., Contrib. Sci. 214: 11-15. ♀, ♀, ♂.

Biology: Wheeler and Wheeler, 1973. Ants of Deep Canyon, p. 127.

**yuma** Wheeler. W. Ariz., s. Nev., s. Calif.; Mexico.

*Myrmecocystus yuma* Wheeler, 1912. Psyche 19: 174, 176. ♀.

Taxonomy: Creighton, 1956. Amer. Mus. Novitates 1087: 1.

## TRIBE FORMICINI

### Genus FORMICA Linnaeus

*Formica* Linnaeus, 1758. Syst. Nat., Ed. 10, v. 1, p. 579.

Type-species: *Formica rufa* Linnaeus. Desig. by Curtis, 1839.

*Serviformica* Forel, 1913. Soc. Ent. de Belg., Ann. 57: 361.

Type-species: *Formica fusca* Linnaeus. Orig. desig.

*Raptiformica* Forel, 1913. Soc. Ent. de Belg., Ann. 57: 361.

Type-species: *Formica sanguinea* Latreille. Orig. desig.

*Formica* subg. *Neoformica* Wheeler, 1913. N. Y. Acad. Sci., Ann. 23: 82.

Type-species: *Formica pallide-fulva* Latreille. Desig. by Wheeler, 1913.

*Coptoformica* Mueller, 1923. Soc. Adriat. di Sci. Nat. Trieste, Bol. 28: 133.

Type-species: *Formica exsecta* Nylander. Desig. by Donisthorpe, 1941.

*Adformica* Lomnicki, 1925. Polskie Pismo Ent. 3: 164.

Type-species: *Formica exsecta* Nylander. Desig. by Donisthorpe, 1941.

This is a large and complex holarctic genus, and the largest genus of ants in America north of Mexico. Various habit patterns are found in this genus including slave-making, temporary social parasitism of various types, and various methods of nest founding and nest construction. Subgenera are not recognized in the following listing, only species groups which more or less reflect the groupings by Creighton (1950) and Buren (1968). *Proformica*, apparently a valid genus found in Europe, is deleted from the North American fauna, and those species previously listed in that

subgenus along with a number of species excluded from *Raptiformica* by Buren are here listed in the species group *neogagates*. Those species included in the subgenus *Raptiformica* by Buren (1968) are listed here in the species group *sanguinea*. The species previously included in the subgenus *Neoformica* are listed here in the *pallidefulva* species group. The other species groups, *microgyna*, *exsecta*, *fusca*, and *rufa*, are essentially the same as before. Further studies may clarify the species groupings and determine the necessity of establishing subgenera.

Revision: Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 643-654, 657-665. —Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 387-399, 401-536, 560-565. —Creighton, 1940. Amer. Mus. Novitates 1055: 1-10 (*rufa* subsp.). —Creighton, 1950. Harvard Univ., Mus. Comp. Zool., Bul. 104:450-552. —Francoeur, 1973. Ent. Soc. du Quebec, Mem. 3, 316 pp. (*fusca* group).

Taxonomy: Yarrow, 1950. Internatl. Comm. Zool. Nomencl., Bul. Zool. Nomencl. 4: 408. —Wheeler and Wheeler, 1953. Ent. Soc. Amer., Ann. 46: 160 (larvae). —Yarrow, 1955. Internatl. Comm. Zool. Nomencl., Bul. Zool. Nomencl. 9: 313-318 (type-species). —Wilson and Brown, 1955. Psyche 62: 108-129 (notes on *sanguinea* and *neogagates* groups). —Gregg, 1964. Colo. Univ. Mus., Leaflet No. 13, pp. 59-69 (distribution in mountains of Colo.). —Gregg, 1969. Ent. Soc. Wash., Proc. 71: 38-49 (geographical distribution of genus in world). —Buren, 1968. Ga. Ent. Soc., Jour. 3: 25-40 (fundamental taxonomic problems; subg. *Raptiformica*).

Biology: Gosswald, 1957. Insectes Sociaux 4: 335-348 (caste determination). —Kannowski, 1959. Insectes Sociaux 6: 147. —Kannowski and Johnson, 1969. Anim. Behaviour 17: 425-429 (male patrolling behavior and sex attraction). —Rosengren, 1971. Acta Zool. Fennica 133, 106 pp. (route fidelity, visual memory, recruitment behavior).

Morphology: Osman and Kloft, 1961. Insectes Sociaux 8: 383-395 (venom).

#### SPECIES GROUP NEOGAGATES

Species of this group nest in small colonies in the soil, sometimes under stones or beneath other objects. They are commonly enslaved by members of the *microgyna* and *sanguinea* groups.

Taxonomy: Wilson and Brown, 1955. Psyche 62: 108-129. —Buren, 1968. Ga. Ent. Soc., Jour. 3: 25-40.

**bradleyi** Wheeler. Man., Minn., Iowa w. to Alta., Mont., Wyo., Colo. Ecology: Nests only in sand or sandy soil among grass clumps or with low irregular mounds.

*Formica bradleyi* Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 389, 423. ♀, ♂. *Formica* (*Proformica*) *neogagates neogagates* var. *morbida* Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 400, 538. ♀, ♀.

Taxonomy: Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 535. —Wheeler and Wheeler, 1953. Ent. Soc. Amer., Ann. 46: 168-169 (larva). —Wilson and Brown, 1955. Psyche 62: 126-127.

Biology: Wheeler and Wheeler, 1944. N. Dak. Hist. Quart. 11: 258-259. —Beamer and Michner, 1950. Kans. Ent. Soc., Jour. 23: 110-113 (relationship with leafhoppers).

—Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 206-209. —Gregg, 1963. Ants of Colo., pp. 602-606. —Snelling, 1969. Ent. Soc. Wash., Proc. 71: 196-197. —Halverson, *et al.* 1976. Kans. Ent. Soc., Jour. 49: 280-303 (natural history of the sandhill ant).

**lasioides** Emery. N. S., Que. w. to B. C. s. to Mass., Mich., S. Dak., Colo., N. Mex., Ariz., Calif. Ecology: Commonly found in grasslands where it nests under stones or in nests with exposed entrances or small craters, but also found in other habitats.

*Formica lasioides* Emery, 1893. Zool. Jahrb., Abt. f. System 7: 646, 664. ♀.

*Formica lasioides* var. *picea* Emery, 1895. Zool. Jahrb., Abt. f. System. 8: 335. ♀. Preocc. by Nylander, 1846.

*Formica lasioides* var. *vetula* Wheeler, 1912. Psyche 19: 90. N. name for *picea* Emery.

Taxonomy: Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 400, 540-541 (each caste). —Gregg, 1944. Ent. Soc. Amer., Ann. 37: 472. —Buren, 1944. Iowa State Col., Jour. Sci. 18: 299.

- Biology: Cole, 1942. Amer. Midland Nat. 28: 384. —Wheeler and Wheeler, 1944. N. Dak. Hist. Quart. 11: 268-269. —Kincaid, 1963. Amer. Micros. Soc., Trans. 82: 101-105 (as pollinators of plants). —Wheeler and Wheeler, 1963. Ants of N. Dak. pp. 209-211, 502. —Gregg, 1963. Ants of Colo., pp. 498-500, 502. —Cole, 1966. Brigham Young Univ., Sci. Bul., Biol. Ser. 7: 23 (Nev. Test Site).
- limata** Wheeler. Minn., N. Dak., Colo., N. Mex., Utah, Nev. Ecology: Commonly nests in grasslands under stones or in crater nests; tolerant of dry situations.  
*Formica (Proformica) limata* Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 400, 541. ♀.
- Biology: Wheeler and Wheeler, 1944. N. Dak. Hist. Quart. 11: 268. —Gregg, 1946. Amer. Midland Nat. 35: 750. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 211-212. —Gregg, 1963. Ants of Colo., pp. 502, 504. —Cole, 1966. Brigham Young Univ., Sci. Bul., Biol. Ser. 7: 24 (Nev. Test Site).
- manni** Wheeler. Idaho, Utah, Wash., Oreg., Nev., Calif. Ecology: Nests are often under stones in gravelly or sandy soil of desert areas.  
*Formica manni* Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 389, 420. ♂, ♀.
- Taxonomy: Wilson and Brown, 1955. Psyche 62: 127-128.
- Biology: Cole, 1942. Amer. Midland Nat. 28: 376, 378-379.
- neogagates** Emery. N. S., Que. w. to Alaska s. to N. C., Ill., Iowa, Nebr., N. Mex., Ariz., Calif. Ecology: Nests most often in grasslands in dry and stony situations, under stones or in the open with or without an irregular mound or crater.  
*Formica fusca subpolita* var. *neogagates* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 646, 661. ♀, ♀, ♂.
- Formica (Proformica) neogagates neogagates* var. *vinculans* Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 400, 539. ♀, ♀.
- Taxonomy: Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 400, 536-538 (each caste). —Wheeler, 1917. Conn. State Geol. and Nat. Hist. Survey Bul. 22: 596. —Wheeler and Wheeler, 1953. Ent. Soc. Amer., Ann. 46: 158-159 (larva).
- Biology: Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21: 401. —Wesson and Wesson, 1940. Amer. Midland Nat. 24: 102. —Wheeler and Wheeler, 1944. N. Dak. Hist. Quart. 11: 268. —Buren, 1944. Iowa State Col., Jour. Sci. 18: 299. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 212-214. —Gregg, 1963. Ants of Colo., pp. 503-505. —Cole, 1966. Brigham Young Univ., Sci. Bul., Biol. Ser. 7: 26 (Nev. Test Site).
- obtusopilosa** Emery. Minn. w. to Alta. s. to Nebr., N. Mex., Utah, Nev. Ecology: Small colonies are found under stones or in exposed soil usually with irregular mounds or craters in meadows and grasslands.  
*Formica sanguinea obtusopilosa* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 643, 648. ♀.
- Formica munda* Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21: 267. ♀, ♀.
- Formica munda* var. *alticola* Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 534. ♀.
- Taxonomy: Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 389, 414-418. —Wilson and Brown, 1955. Psyche 62: 128.
- Biology: Cole, 1942. Amer. Midland Nat. 28: 378. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 217-219. —Gregg, 1963. Ants of Colo., pp. 608-611. —Cole, 1966. Brigham Young Univ., Sci. Bul., Biol. Ser. 7: 26 (Nev. Test Site).
- oregonensis** Cole. Oreg. (Pendleton).  
*Formica oregonensis* Cole, 1938. Amer. Midland Nat. 20: 368. ♀.
- Taxonomy: Cole, 1956. Tenn. Acad. Sci., Jour. 31: 212-214.
- Biology: Kincaid, 1963. Amer. Micros. Soc., Trans. 82: 101-105 (pollinators of plants).
- perpilosa** Wheeler. Wyo., Colo., Kans., Okla., Tex. w. to Calif.; Mexico. Ecology: Usually constructs crater nests in the soil in grasslands and open fields.  
*Formica fusca subpolita* var. *perpilosa* Wheeler, 1902. Soc. Cient. "Antonio Alzate" Mem. y Rev. 17: 141. ♀, ♀.

**Taxonomy:** Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 389, 421-423 (each caste). —Cole, 1942. Amer. Midland Nat. 28: 376-378. —Wilson and Brown, 1955. Psyche 62: 128.

**Biology:** Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 534. —Cole, 1934. Ent. Soc. Amer., Ann. 27: 401. —Mallis, 1941. South. Calif. Acad. Sci., Bul. 40: 85. —LaBerge, 1952. Kans. Ent. Soc., Jour. 25: 59. —Gregg, 1963. Ants of Colo., pp. 611-613.

## SPECIES GROUP PALLIDEFULVA

Members of this group nest in the soil under stones or at the base of tufts of grass. There is usually no mound or crater marking the nest. They serve as hosts of slave-making species of *Formica*.

**Taxonomy:** Creighton, 1950. Harvard Univ., Mus. Comp. Zool., Bul. 104: 543-552 (subg. *Neoformica*).

**archboldi** Smith. Ga., Ala., Fla.

*Formica pallide-fulva archboldi* Smith, 1944. Fla. Ent. 27: 16. ♀.

**Biology:** Schneirla, 1944. Amer. Mus. Novitates 1261: 1-2.

**pallidefulva nitidiventris** Emery. Ont., Que. s. to Ga. w. to Wis., S. Dak., Wyo., Colo., N. Mex.

*Formica pallide-fulva nitidiventris* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 645, 656. ♀, ♀, ♂.

*Formica pallide-fulva schaufussi* var. *incerta* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 645, 655. ♀, ♀, ♂.

*Formica pallide-fulva fuscata* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 645, 656. ♀.

*Formica pallide-fulva delicata* Cole, 1938. Amer. Midland Nat. 20: 369. ♀, ♀.

**Taxonomy:** Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21: 401. —Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 401, 554-557. —Wheeler, 1917. Conn. State Geol. and Nat. Hist. Survey Bul. 22: 595, 598. —Buren, 1944. Iowa State Col., Jour. Sci. 18: 299, 309-310. —Wheeler and Wheeler, 1953. Ent. Soc. Amer., Ann. 46: 159-160 (larva).

**Biology:** Wheeler, 1904. Amer. Mus. Nat. Hist., Bul. 20: 370-371. —Wheeler, 1917. Ind. Acad. Sci., Proc. 26: 465. —Rau, 1934. Acad. Sci. St. Louis, Trans. 28: 211-212. —Wesson and Wesson, 1940. Amer. Midland Nat. 24: 102. —Talbot, 1946. Ecology 27: 65-70. —Schread and Chapman, 1948. Conn. (State) Agr. Expt. Sta. Bul. 515: 18. —Talbot, 1948. Ecology 29: 316-325. —Gregg, 1963. Ants of Colo., pp. 628-630.

**pallidefulva pallidefulva** Latreille. N. Y., N. J. s. to Fla. w. to Colo., Okla., Tex.

*Formica pallide-fulva* Latreille, 1802. Hist. Nat. Fourmis, p. 174. ♀.

*Formica pallide-fulva* var. *succinea* Wheeler, 1904. Amer. Mus. Nat. Hist., Bul. 20: 369. ♀.

**Taxonomy:** Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 645, 656-657. —Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 401, 548-552.

**Biology:** Dennis, 1938. Ent. Soc. Amer., Ann. 31: 298, 306. —Cole, 1940. Amer. Midland Nat. 24: 81. —Schneirla, 1944. Amer. Mus. Novitates 1261: 2-3. —Gregg, 1963. Ants of Colo., pp. 625-628.

**schaufussi dolosa** Wheeler. Va. s. to Fla. w. to Iowa, Colo., Tex.

*Formica pallide-fulva schaufussi* var. *meridionalis* Wheeler, 1904. Amer. Mus. Nat. Hist., Bul. 20: 370. ♀. Preocc. by Ruzsky, 1889.

*Formica pallide-fulva schaufussi* var. *dolosa* Wheeler, 1912. Psyche 19: 90. N. name for *meridionalis* Wheeler.

**Taxonomy:** Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 401, 554 (worker, female). —Cole, 1940. Amer. Midland Nat. 24: 73, 79. —Buren, 1944. Iowa State Col., Jour. Sci. 18: 299.

**Biology:** Dennis, 1938. Ent. Soc. Amer., Ann. 31: 299, 306. —Gregg, 1963. Ants of Colo., pp. 630-632.

**schaufussi schaufussi** Mayr. Ont. s. to N. C., Tenn. w. to Wis., Iowa.

*Formica Schaufussi* Mayr, 1886. Akad. der Wiss. Wien, Math.-Nat. Kl. Sitzber. 53: 493. ♀.

Taxonomy: Wheeler, 1904. Amer. Mus. Nat. Hist., Bul. 20: 370. —Wheeler, 1913. Harvard Univ., Mus. Comp. Zool. Bul. 53: 401, 552-553 (each caste). —Cole, 1940. Amer. Midland Nat. 24: 73.

Biology: Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21: 400. —Wheeler, 1917. Conn. State Geol. and Nat. Hist. Survey Bul. 22: 598. —Dennis, 1938. Ent. Soc. Amer., Ann. 31: 298, 306.

## SPECIES GROUP FUSCA

Members of this group nest in the soil, and the nest is commonly started under objects or at the base of tufts of grass. Excavated soil may be spread out in the form of an irregular crater or low mound about the nest openings. Because of their ubiquity and usual docility, they are common hosts for many of the slave-making species of *Formica*.

Revision: Francoeur, 1973. Soc. Ent. du Quebec, Mem. no. 3, 316 pp.

*accreta* Francoeur. B. C., Mont., Idaho, Wash., Oreg., Calif.

*Formica accreta* Francoeur, 1973. Soc. Ent. du Quebec, Mem. no. 3, pp. 182-189. ♀, ♀, ♂.

*aerata* Francoeur. Oreg., Nev., Calif. Ecology: Found in sandy soil where it nests under rocks.

*Formica aerata* Francoeur, 1973. Soc. Ent. du Quebec, Mem. no. 3, pp. 116-122. ♀, ♀.

*altipetens* Wheeler. Mont., Wyo., Colo., N. Mex., Idaho, Utah, Ariz., Calif. Ecology: Nests in forested and open areas in the soil; low mounds are sometimes built, but nests are also under objects.

*Formica cinerea cinerea* var. *altipetens* Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 399, 523. ♀, ♀, ♂.

Taxonomy: Francoeur, 1973. Soc. Ent. du Quebec, Mem. no. 3, pp. 52-60.

Biology: Gregg, 1963. Ants of Colo., pp. 507-509. —Funk, 1975. Lepidop. Soc., Jour. 29: 261-262 (association with Lycaenidae).

*argentea* Wheeler. Que. w. to B. C. s. to S. C., Ohio, Ill., Iowa, S. Dak., N. Mex., Ariz., Calif.

Ecology: Found in open or semi-open situations usually in sandy soil under rocks or with a low mound.

*Formica fusca* var. *argentata* Wheeler, 1902. Amer. Nat. 36: 952. ♀. Preocc. by Fabricius, 1804.

*Formica fusca* var. *argentea* Wheeler, 1912. Psyche 19: 90. N. name for *argentata* Wheeler.

*Formica fusca* var. *blanda* Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 398, 510. ♀.

Taxonomy: Francoeur, 1973. Soc. Ent. du Quebec, Mem. no. 3, pp. 141-152 (also ecology).

Biology: Gregg, 1963. Ants of Colo., pp. 521-525.

*canadensis* Santschi. Man., Sask., N. Dak., S. Dak., Kans., Alta., Wyo., Colo., N. Mex., Idaho, Utah, Ariz., Calif. Ecology: Nests in open or wooded areas in the soil, sometimes with a low mound. This species has been confused with *lepida* in much of the literature.

*Formica cinerea* var. *canadensis* Santschi, 1913. Soc. Ent. de Belg., Ann. 57: 435. ♀, ♀.

Taxonomy: Francoeur, 1973. Soc. Ent. du Quebec, Mem. no. 3, pp. 60-67.

*foreliana* Wheeler. S. Ariz.

*Formica foreliana* Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 391, 451. ♀.

Taxonomy: Francoeur, 1973. Soc. Ent. du Quebec, Mem. no. 3, pp. 234-238.

*fusca* Linnaeus. Newfoundland (insular) w. to Yukon s. to N. C., Ill., Iowa, S. Dak., N. Mex., Ariz., Calif.; Holarctic. Ecology: Nests in a wide variety of situations, in forests or open areas, under rocks, logs, in soil, or in rotting wood. Two forms are recognized by Francoeur (1973), form *subaenescens* which is mostly eastern and form *marcida* which is mostly western in distribution.

*Formica fusca* Linnaeus, 1758. Syst. Nat., Ed. 10, v. 1, p. 580.

*Formica fusca* var. *subaenescens* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 646, 659-660. ♀, ♀.

*Formica fusca fusca* var. *marcida* Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 398, 503. ♀, ♀.



**Taxonomy:** Creighton, 1950. Harvard Univ., Mus. Comp. Zool., Bul. 104: 532. —Wheeler and Wheeler, 1953. Ent. Soc. Amer., Ann. 46: 164-165 (larva). —Yarrow, 1954. Soc. Brit. Ent., Trans. 11: 229-244. —Francoeur, 1973. Soc. Ent. du Quebec, Mem. no. 3, pp. 189-201.

**Biology:** King, 1949. Iowa Acad. Sci., Proc. 56: 367-370 (in mixed colony with *Formica reflexa* Buren). —King, 1951. Iowa Acad. Sci., Proc. 58: 487-489. —Kannowski, 1959. Insectes Sociaux 6: 141-142. —Wallis, 1960. Insectes Sociaux 7: 187-190 (spinning movements of larvae). —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 264-268. —Gregg, 1963. Ants of Colo., pp. 514-525. —Cole, 1966. Brigham Young Univ., Sci. Bul., Biol. Ser. 7: 23 (Nev. Test Site).

**glacialis** Wheeler. Newfoundland (insular) s. to N. Y. w. to Man., N. Dak., Ill. Ecology: Found in woods or open fields where it builds its nests in the soil and with a low mound commonly covered with grass. This species has been confused with *fusca* L. in much of the literature.

*Formica fusca* var. *glacialis* Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24: 624. ♀, ♀, ♂.

**Taxonomy:** Francoeur, 1973. Soc. Ent. du Quebec, Mem. no. 3, pp. 151-161 (also ecology).

**gnava** Buckley. Tex., Colo., N. Mex., Utah, Ariz., Nev., Calif.; Mexico. Ecology: Found in desert and semi-desert areas or open woods where it nests in the soil, normally under rocks.

*Formica gnava* Buckley, 1866. Ent. Soc. Phila., Proc. 6: 156. ♀, ♀, ♂.

**Taxonomy:** Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 390, 518-521 (each caste). —Cole, 1942. Amer. Midland Nat. 28: 377, 380, 383. —Francoeur, 1973. Soc. Ent. du Quebec, Mem. no. 3, pp. 238-245.

**Biology:** Wheeler, 1902. Tex. Acad. Sci., Trans. 4: 20. —Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 541, 550. —Cole, 1934. Ent. Soc. Amer., Ann. 27: 388. —Mallis, 1941. South. Calif. Acad. Sci., Bul. 40: 86. —Gregg, 1963. Ants of Colo., pp. 539-541.

**hewitti** Wheeler. Que., Maine w. to B. C. s. to Minn., N. Mex., Utah, Calif. Ecology: Found in open or semi-open woods and forests where it nests in the soil under rocks or in rotting wood.

*Formica hewitti* Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 552. ♀, ♀, ♂.

**Taxonomy:** Francoeur, 1973. Soc. Ent. du Quebec, Mem. no. 3, pp. 208-215.

**Biology:** Gregg, 1963. Ants of Colo., pp. 526-527.

**lepida** Wheeler. Calif. Has been found only in the north coastal region.

*Formica cinerea cinerea* var. *lepida* Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 399, 526. ♀.

**Taxonomy:** Francoeur, 1973. Soc. Ent. du Quebec, Mem. no. 3, pp. 122-125.

**longipilosa** Francoeur. Calif. (Mendocino Co.).

*Formica longipilosa* Francoeur, 1973. Soc. Ent. du Quebec, Mem. no. 3, pp. 125-128. ♀.

**microphthalma** Francoeur. Calif. Ecology: In mountains; may construct small crater nests in the soil.

*Formica microphthalma* Francoeur, 1973. Soc. Ent. du Quebec, Mem. no. 3, pp. 201-207. ♀, ♂.

**moki** Wheeler. Utah, Ariz., Nev., Calif. Ecology: Nests in soil under rocks; the nest is unmarked and the entrance is usually a hole near a bush or tree. Francoeur (1973) chose to use the name *occidua* for this species because *occidua* has been used more in the literature; however, the case has not been referred to the Commission.

*Formica moki* Wheeler, 1906. Amer. Mus. Nat. Hist., Bul. 22: 343. ♀.

*Formica rufibarbis* var. *occidentalis* Wheeler, 1910. Ants, p. 570. Nomen nudum. Preocc. by Buckley, 1866.

*Formica rufibarbis* var. *occidua* Wheeler, 1912. Psyche 19: 90. Nomen nudum. N. name for *occidentalis* Wheeler.

*Formica rufibarbis* var. *occidua* Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 398, 517. ♀, ♀.

**Taxonomy:** Smith, 1939. Ent. Soc. Amer., Ann. 32: 582-583. —Cole, 1943. Amer. Midland Nat. 29: 183. —Cole, 1966. Brigham Young Univ., Sci. Bul., Biol. Ser. 7: 24-25 (male, also

biological notes). —Francoeur, 1973. Soc. Ent. du Quebec, Mem. no. 3, pp. 254-259 (as *occidua*).

Biology: Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 550. —Eckert and Mallis, 1937. Calif. Agr. Expt. Sta. Cir. 342: 30. —Mallis, 1941. South. Calif. Acad. Sci., Bul. 40: 86. —Cole, 1942. Amer. Midland Nat. 28: 385. —Wenner, 1959. Amer. Midland Nat. 62: 174. —Wheeler and Wheeler, 1973. Ants of Deep Canyon, pp. 128-129.

**montana** Emery. Ohio, Wis., Ill., Minn., Iowa, Man., N. Dak., S. Dak., Nebr., Kans., Colo.

Ecology: A prairie species; nests in earthen mounds, often in natural hummocks, commonly covered with grass. Sometimes uses thatching.

*Formica fusca subpolita* var. ? *montana* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 646, 663. ♀.

*Formica cinerea* var. *neocinerea* Wheeler, 1910. Ants, p. 571. Nomen nudum.

*Formica cinerea* var. *neocinerea* Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 524. ♀, ♀, ♂.

*Formica cinerea cinerea* var. *rutilans* Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 399, 525. ♀.

Taxonomy: Francoeur, 1973. Soc. Ent. du Quebec, Mem. no. 3, pp. 67-74.

Biology: Wheeler, 1902. Amer. Nat. 36: 948-952. —Wheeler, 1910. Ants, pp. 201, 203, 460-461, 475. —Wheeler, 1917. Psyche 22: 206. —Amstutz, 1943. Ohio Jour. Sci. 43: 172. —Gregg, 1948. Ent. Soc. Wash., Proc. 50: 183-186. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 263-264 (also as *altipetens*, pp. 260-261). —Gregg, 1963. Ants of Colo., pp. 513-514.

Morphology: Hung, 1969. Ent. Soc. Amer., Ann. 62: 455 (chromosome number).

**neoclara** Emery. N. Dak., S. Dak., Iowa, Kans., Tex. w. and northwest to N. W. T., B. C.,

Wash., Oreg., Calif. Ecology: Found in grasslands or open woods where it nests in the soil, usually preferring sandy soil; nests are sometimes at the base of plants and sometimes have loose mounds of vegetable debris or excavated soil.

*Formica fusca* var. *neoclara* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 646, 661. ♀.

*Formica fusca pruinosa* Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 548. ♀, ♀, ♂.

*Formica fusca pruinosa* var. *lutescens* Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 549. ♀.

Taxonomy: Wheeler and Wheeler, 1953. Ent. Soc. Amer., Ann. 46: 165 (larva). —Francoeur, 1973. Soc. Ent. du Quebec, Mem. no. 3, pp. 84-94.

Biology: Wheeler, 1910. Ants, pp. 201, 460-461, 463. —LaBerge, 1952. Kans. Ent. Soc., Jour. 25: 59. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 268-271. —Gregg, 1963. Ants of Colo., pp. 526, 528-530 (also as *pruinosa*, pp. 537-539).

**neorufibarbis** Emery. Newfoundland (Labrador) w. to Alaska s. to Mass., Mich., Minn., S. Dak., N. Mex., Ariz., Calif. Ecology: A dominant ant in the boreal and alpine forests of North America; usually nests in rotting wood but occasionally in the soil under rocks.

*Formica fusca* var. *neorufibarbis* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 646, 660. ♀.

*Formica fusca* var. *algida* Wheeler, 1915. Psyche 22: 205. ♀, ♀.

*Formica fusca fusca* var. *gelida* Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 399, 505. ♀, ♀, ♂.

Taxonomy: Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 546-547. —Wheeler and Wheeler, 1953. Ent. Soc. Amer., Ann. 46: 165 (larva). —Francoeur, 1973. Soc. Ent. du Quebec, Mem. no. 3, pp. 215-228.

Biology: Brown, 1955. Ent. News 66: 47-50. —Kannowski, 1959. Insectes Sociaux 6: 142.

—Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 271-273. —Gregg, 1963. Ants of Colo., pp. 530-536. —Cole, 1966. Brigham Young Univ., Sci. Bul., Biol. Ser. 7: 26 (Nev. Test Site).

**occulta** Francoeur. Wyo., Colo., N. Mex., Utah, Ariz., Oreg.

*Formica occulta* Francoeur, 1973. Soc. Ent. du Quebec, Mem. no. 3, pp. 94-101. ♀, ♀, ♂.

**pacifica** Francoeur. B. C., Wash., Oreg., Calif.

*Formica pacifica* Francoeur, 1973. Soc. Ent. du Quebec, Mem. no. 3, pp. 131-135. ♀, ♀.

**pilicornis** Emery. Calif.; Mexico. Ecology: Found at low elevations in the coast ranges north to the San Francisco area; makes crater or mound nests in sandy soil, sometimes under rocks.

*Formica pilicornis* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 646, 664. ♀, ♂, ♂.

Taxonomy: Francoeur, 1973. Soc. Ent. du Quebec, Mem. no. 3, pp. 74-80.

Biology: Cole, 1934. Ent. Soc. Amer., Ann. 27: 401. —Eckert and Mallis, 1937. Calif. Agr.

Expt. Sta. Cir. 342: 7, 29. —Mallis, 1941. South. Calif. Acad. Sci., Bul. 40: 85.

**podzolica** Francoeur. N. S., Que. w. to Alaska s. to Pa., Wis., Iowa, S. Dak., N. Mex., Ariz., Calif. Ecology: A species of the boreal and alpine forests of North America. Nests are in the soil, commonly sandy soil on beaches or shores and are craterlike or moundlike. Has been confused with *F. fusca* L. in the literature.

*Formica podzolica* Francoeur, 1973. Soc. Ent. du Quebec, Mem. no. 3, pp. 167-172. ♀, ♀, ♂.

**sibylla** Wheeler. Oreg., Nev., Calif. Ecology: Makes crater nests in the soil, usually in woodlands.

*Formica sibylla* Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 399, 530. ♀, ♀.

Taxonomy: Francoeur, 1973. Soc. Ent. du Quebec, Mem. no. 3, pp. 263-268.

Biology: Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 551. —Mallis, 1941. South. Calif. Acad. Sci., Bul. 40: 87.

**subelongata** Francoeur. Calif. (Burney Junction, Shasta Co.).

*Formica subelongata* Francoeur, 1973. Soc. Ent. du Quebec, Mem. no. 3, pp. 268-270. ♀.

**subpolita** Mayr. B. C., Idaho, Wash., Oreg., Nev., Calif. Ecology: Usually found in semi-desert areas where it nests in sandy or gravelly soil; nests may be craterlike or moundlike.

*Formica fusca* var. *subpolita* Mayr, 1886. Zool.-Bot. Gesell. Wien, Verh. 36: 426. ♀, ♀.

*Formica rufiventris* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 665. ♂. Preocc. by Fabricius, 1804.

*Formica flammiventris* Wheeler, 1912. Psyche 19: 90. N. name for *rufiventris* Emery.

*Formica subpolita* var. *camponoticeps* Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 399, 535. ♀.

*Formica subpolita* var. *ficticia* Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 561. ♀, ♀, ♂.

Taxonomy: Francoeur, 1973. Soc. Ent. du Quebec, Mem. no. 3, pp. 106-115.

Biology: Wheeler, 1910. Ants, pp. 201, 460. —Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 553-554. —Mallis, 1941. South. Calif. Acad. Sci., Bul. 40: 87. —Cole, 1942. Amer.

Midland Nat. 28: 384, 377. —Cole, 1966. Brigham Young Univ., Sci. Bul., Biol. Ser. 7: 26 (Nev. Test Site). —Wheeler and Wheeler, 1973. Ants of Deep Canyon, p. 129.

**subsericea** Say. N. B., Que. s. to Fla. w. to Man., Mont., Iowa, Kans., Mo., Miss. Ecology:

Occurs in open deciduous woodlands where it nests in the soil under stones or leaf litter; sometimes builds low mounds which may be covered with debris. This species has been confused with *F. fusca* L. in the literature.

*Formica subsericea* Say, 1836. Boston Jour. Nat. Hist. 1: 289. ♀, ♂.

*Formica lecontei* Kennedy and Dennis, 1937. Ent. Soc. Amer., Ann. 30: 542. ♀, ♀, ♂.

Taxonomy: Francoeur, 1973. Soc. Ent. du Quebec, Mem. no. 3, pp. 172-181.

Biology: Kennedy and Dennis, 1937. Ent. Soc. Amer., Ann. 30: 542. —Wilson and Francoeur, 1974. Fla. Ent. 57: 115-116 (Fla.).

**transmontanis** Francoeur. Alta., B. C., Mont., Idaho, Calif.

*Formica transmontanis* Francoeur, 1973. Soc. Ent. du Quebec, Mem. no. 3, pp. 135-140. ♀, ♀, ♂.

**xerophila** Smith. Wash., Utah, Ariz., Calif.

*Formica (Neoformica) moki xerophila* Smith, 1939. Ent. Soc. Amer., Ann. 32: 583. ♀.

*Formica moki grundmanni* Cole, 1943. Amer. Midland Nat. 29: 184. ♀.

Taxonomy: Francoeur, 1973. Soc. Ent. du Quebec, Mem. no. 3, pp. 259-263.

## SPECIES GROUP EXSECTA

Ants of this group build large conspicuous mounds in fields, woods, or at the edge of woods. The nest founding female may behave as a temporary social parasite, but colonies are also founded by budding.

Taxonomy: Creighton, 1950. Harvard Univ., Mus. Comp. Zool., Bul. 104: 510-515.

**exsectoides** Forel. N. S. Ont. s. to Ga. w. to Wis., Iowa, Kans., Colo., N. Mex. Ecology: A large aggregation of mounds of this species may occur in a single locality. Sometimes damages bark and cambium of small trees and shrubs. Host: *Formica fusca* L. Often locally called the Allegheny mound ant.

*Formica exsectoides* Forel, 1886. Soc. Ent. de Belg., Ann. (C. R.) 30: 38. ♀, ♀.

*Formica exsectoides exsectoides* var. *davisi* Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 396, 484. ♀, ♀.

*Formica exsectoides exsectoides* var. *hesperia* Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 396, 484. ♀.

Taxonomy: Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 643, 653 (worker, male). —Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 396, 481-483 (each caste). —Buren, 1944. Iowa State Col., Jour. Sci. 18: 300. —Wheeler and Wheeler, 1953. Ent. Soc. Amer., Ann. 46: 164 (larva). —Cole, 1954. Tenn. Acad. Sci., Jour. 29: 166.

Biology: McCook, 1877. Amer. Ent. Soc., Trans. 6: 253-295. —Pierson, 1922. Jour. Forestry 20: 325-336. —Manter, 1925. Jour. Econ. Ent. 48: 348-351. —Andrews, 1925. Psyche 32: 75-87 (growth of mounds). —Andrews, 1926. Psyche 33: 127-150. —Andrews, 1929. Ent. Soc. Amer., Ann. 22: 369-391 (association with treehoppers). —Andrews, 1929. Quart. Rev. Biol. 4: 248-257. —Andrews, 1941. Sci. Monthly 43: 530-533. —Haviland, 1947. Jour. Econ. Ent. 40: 413-418 (biology and control). —Schread, 1949. Jour. Econ. Ent. 42: 501. —Gregg, 1963. Ants of Colo., pp. 597-599. —Christensen and Quick, 1970. Iowa Acad. Sci., Proc. 77: 207-209.

Morphology: Eisner and Happ, 1964. Science 134: 329-331 (haemorrhage of a coccinellid beetle and its repellent effect on ants).

**opaciventris** Emery. N. Dak., Mont., Wyo., Colo., N. Mex. Ecology: May construct either earthen mounds or thatched nests.

*Formica exsectoides* var. *opaciventris* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 643, 653. ♀.

Taxonomy: Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 484-485 (worker, male). —Gregg, 1952. Psyche 59: 14-16 (female).

Biology: Cole, 1954. Tenn. Acad. Sci., Jour. 29: 166. —Scherba, 1961. N. Y. Ent. Soc., Jour. 69: 71-87 (reproduction, nest structure). —Scherba, 1963. N. Y. Ent. Soc., Jour. 71: 219-231. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 599-601. —Gregg, 1963. Ants of Colo., pp. 599-601. —Scherba, 1964. N. Y. Ent. Soc., Jour. 72: 231.

**ulkei** Emery. N. S. w. to Man. s. to Ohio, Ind., Ill., Iowa, N. Dak., Wyo. Ecology: The large mounds may be found in woods or grasslands and occasionally have a thin layer of plant debris on their surfaces. Host: *Formica fusca* L.

*Formica ulkei* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 643, 653. ♀.

*Formica ulkei* var. *hebesceus* Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 396, 487. ♀.

Taxonomy: Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 396, 485-487 (each caste). —Buren, 1944. Iowa State Col., Jour. Sci. 18: 300. —Gregg, 1944. Ent. Soc. Amer., Ann. 37: 472. —Wheeler and Wheeler, 1953. Ent. Soc. Amer., Ann. 46: 168 (larva).

Biology: Holmquist, 1928. Ecology 9: 70-87. —Holmquist, 1928. Physiol. Zool. 1: 325-327. —Park, 1929. Psyche 36: 195-215. —Dreyer and Park, 1932. Psyche 39: 127-133. —Creighton, 1934. Psyche 41: 185-200. —Park, 1936. Psyche 42: 216-231. —Scherba, 1958. Insectes Sociaux 5: 201-213 (reproduction, mounds). —Kannowski, 1959. Insectes Sociaux 6: 142-143. —Talbot, 1959. Amer. Midland Nat. 61: 128-132 (flight activities). —Scherba, 1959. Amer. Midland Nat. 61: 499-508 (moisture regulation in mounds). —Talbot, 1961.

Ecology 42: 202-205 (mounds). —Scherba, 1962. Amer. Midland Nat. 67: 373-385 (mound temperatures). —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 256-258.

Morphology: Hung, 1969. Ent. Soc. Amer., Ann. 62: 456 (chromosome number).

#### SPECIES GROUP RUFA

Nests of members of this group are varied, some species build mounds and others make considerable use of thatching. Nests are usually started beneath objects. Nest founding females of some species may behave as temporary social parasites.

Taxonomy: Creighton, 1940. Amer. Mus. Novitates 1055: 1-10 (N. Amer. variants of *Formica rufa*). —Creighton, 1950. Harvard Univ., Mus. Comp. Zool., Bul. 104: 472-496.

**aterrima** Cresson. Colo. Known only from the type male which has not been associated with any other described form.

*Formica aterrima* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 426. ♂.

Taxonomy: Brown, 1947. Ent. News 58: 8-9. —Gregg, 1963. Ants of Colo., pp. 544, 546.

**calviceps** Cole. N. Mex. (Capulin Mt. Natl. Mon.). Ecology: Colony found beneath large stones which were banked with detritus.

*Formica (Formica) calviceps* Cole, 1954. Tenn. Acad. Sci., Jour. 29: 164-165. ♀.

**ciliata** Mayr. Minn., N. Dak., Mont., Wyo., Colo., Utah. Ecology: Nests in meadows or open woods; sometimes utilizes thatching.

*Formica ciliata* Mayr, 1886. Zool.-Bot. Gesell. Wien, Verh. 36: 428. ♀.

Taxonomy: Wheeler, 1903. Amer. Mus. Nat. Hist., Bul. 19: 639-643 (each caste). —Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 392-393, 452-454 (each caste).

Biology: Wheeler, 1909. N. Y. Ent. Soc., Jour. 17: 88. —Wheeler, 1910. Ants, pp. 114, 120, 205, 351, 444-445, 450. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 233-234. —Gregg, 1963. Ants of Colo., pp. 545-547.

**comata** Wheeler. S. Dak., Mont., Colo. Ecology: Nests under stones which are banked with thatch.

*Formica comata* Wheeler, 1909. N. Y. Ent. Soc., Jour. 17: 85. ♀, ♀, ♂.

Taxonomy: Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 392, 393, 454-456 (each caste). —Cole, 1942. Amer. Midland Nat. 28: 376, 379 (also biological notes).

Biology: Gregg, 1963. Ants of Colo., pp. 547-548, 550.

**criniventris** Wheeler. N. Dak., S. Dak., Mont. s. to Colo., Utah. Ecology: Found in meadows and open forests where it nests under stones banked with thatch.

*Formica crinita* Wheeler, 1909. N. Y. Ent. Soc., Jour. 17: 87. ♀, ♀. Preocc. by Smith, 1858.

*Formica criniventris* Wheeler, 1912. Psyche 19: 90. N. name for *crinita* Wheeler.

Taxonomy: Wheeler 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 392, 393, 457-458. —Cole, 1942. Amer. Midland Nat. 28: 376, 379.

Biology: Wheeler, 1910. Ants, pp. 114, 444-445, 450. —Wheeler and Wheeler, 1944. N. Dak. Hist. Quart. 11: 260. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 234-236. —Gregg, 1963. Ants of Colo., pp. 549-551.

**dakotensis** Emery. N. S., Ont. w. to Alaska, B. C. s. to Ohio, Iowa, N. Mex., Nev. Ecology:

Usually found in grasslands where it nests in earthen mounds or under stones, about roots of plants, and in grass clumps banked with considerable detritus. Host: *Formica fusca* L., *F. lepida* Wheeler, *F. montana* Emery, *F. pallidefulva* Latreille. Some authors have recognized two subspecies, *dakotensis* east of the Rockies and *montigena* in the Rockies and westward.

*Formica dakotensis* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 644, 652. ♀.

*Formica fusca subpolita* var. ? *specularis* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 663. ♀.

*Formica dacotensis* var. *Wasmanni* Forel, 1904. Soc. Ent. de Belg., Ann. 48: 153. ♀, ♀, ♂.

*Formica montigena* Wheeler, 1904. Amer. Mus. Nat. Hist., Bul. 20: 374. ♀, ♀, ♂.

*Formica dakotensis* var. *saturata* Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 542. ♀.

- Taxonomy: Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 391, 393, 394, 462-465. —Buren, 1944. Iowa State Col., Jour. Sci. 18: 299. —Brown, 1957. Ent. News 68: 167.
- Biology: Wheeler, 1904. Amer. Mus. Nat. Hist., Bul. 20: 364-365. —Wheeler, 1910. Ants, pp. 113, 205, 444-445. —Abbott, 1926. Ent. News 37: 210-211. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 236-238. —Gregg, 1963. Ants of Colo., pp. 551-554.
- Morphology: Abbott, 1937. Ent. Soc. Amer., Ann. 20: 117-122 (physiology).
- ferocula** Wheeler, Ill. (Rockford). Ecology: Type specimens were found nesting in a dry open field in small crater nests.
- Formica ferocula* Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 392, 461. ♀.
- fossiceps** Buren. Que., Iowa, N. Dak. Ecology: Found in grasslands and wooded pastures nesting under stones or fallen logs banked with thatch or in low earthen mounds covered with fine thatch of grass materials.
- Formica fossiceps* Buren, 1942. Iowa State Col., Jour. Sci. 16: 402. ♀, ♀, ♂.
- Biology: Buren, 1944. Iowa State Col., Jour. Sci. 18: 300, 302. —King, 1949. Iowa Acad. Sci., Proc. 56: 367-370 (mixed colony with *F. obscuriventris clivia*). —King, 1951. Iowa Acad. Sci., Proc. 58: 487-489. —King, 1952. Iowa Acad. Sci., Proc. 59: 469-474 (macropseudogynes, or ? pterergates). —King and Sallee, 1957. Iowa Acad. Sci., Jour. 64: 667-669 (mixed colony with *F. obscuriventris clivia*). —King and Sallee, 1959. Iowa Acad. Sci., Proc. 66: 472-473 (slave of *F. rubicunda*). —King and Sallee, 1962. Iowa Acad. Sci., Proc. 69: 531-539 (mixed colony with *F. obscuriventris clivia*). —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 238-239. —Finnegan, 1973. Canad. Ent. 105: 441-444 (diurnal foraging activity).
- haemorrhoidalis** Emery. N. Dak., S. Dak., Colo. w. to B. C., Wash., Calif. Ecology: Found in areas of moderate to sparse cover where nests are usually started under logs or stones and later with moderate use of thatching.
- Formica rufa integra* var. *haemorrhoidalis* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 644, 652. ♀.
- Formica truncicola integroides* var. *ravida* Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 560. ♀, ♀.
- Formica truncicola integroides* var. *tahoensis* Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 538. ♀, ♀.
- Taxonomy: Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 392, 394, 441-442 (each caste). —Cole, 1942. Amer. Midland Nat. 28: 376. —Brown, 1965. Ent. News 76: 181-186. —Cole, 1956. Tenn. Acad. Sci., Jour. 3: 260. —Wheeler and Wheeler, 1963. Ants of N. Dak., p. 230 (forms B, C, and D).
- Biology: Wheeler, 1910. Ants, pp. 206, 444. —Creighton, 1940. Amer. Mus. Novitates 1055: 6-7. —Mallis, 1941. South. Calif. Acad. Sci., Bul. 40: 88-89. —Gregg, 1963. Ants of Colo., pp. 554-557, 579-581.
- integra** Nylander. N. S. s. to Ga. w. to Mich., S. Dak., Ill., Miss. Ecology: Large colonies are found in open forests and woods where they nest in stumps and logs or under stones; plant debris commonly covers the nest.
- Formica integra* Nylander, 1856. Ann. des Sci. Nat., Zool. 5: 62. ♀.
- Formica integra* var. *similis* Mayr, 1886. Zool.-Bot. Gesell. Wien, Verh. 36: 425. ♀, ♀, ♂.
- Taxonomy: Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 392, 394, 444-445 (each caste).
- Biology: Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21: 399. —Wheeler, 1910. Ants, pp. 204-206, 222, 351, 444. —Davis and Bequaert, 1922. Brooklyn Ent. Soc., Bul. 17: 18-19. —Creighton, 1940. Amer. Mus. Novitates 1055: 6. —Kloft, *et al.*, 1973. Fla. Ent. 56: 67-76 (habitat, nest structure, polygamy, biometry).
- integroides coloradensis** Wheeler. Colo., N. Mex., Idaho, Utah. Ecology: Found in forests at high elevations (mostly 8,000 to 10,000 feet); nests are started under stumps or logs and later may be large and dome-shaped with extensive use of thatch.
- Formica truncicola integroides* var. *coloradensis* Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 393, 440. ♀, ♀.
- Taxonomy: Cole, 1942. Amer. Midland Nat. 28: 377, 381.

- Biology: Creighton, 1940. Amer. Mus. Novitates 1055: 6-7. —Gregg, 1963. Ants of Colo. pp. 557-560.
- integroides integroides** Emery. Wash., Oreg., Calif. Ecology: Inhabits open woods in the coastal mountains and west slopes of the Cascades and Sierras where it nests under logs and stumps banked with plant debris.
- Formica rufa obscuriventris* var. *integroides* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 644, 649. ♀.
- Formica truncicola integra* var. *subcaviceps* Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 540. ♀, ♂.
- Taxonomy: Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 393, 394, 438-439. —Creighton, 1940. Amer. Mus. Novitates 1055: 6-7.
- Biology: Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 537. —Miller, 1957. Insectes Sociaux 4: 253.
- integroides planipilis** Creighton. N. Dak., Colo., Nev. Ecology: Found in grasslands and open forests; nests are frequently started at bases of plants and extensive use is made of thatching; completed nests are moundlike.
- Formica rufa planipilis* Creighton, 1940. Amer. Mus. Novitates 1055: 7, 9. ♀.
- Taxonomy: Cole, 1956. Tenn. Acad. Sci., Jour. 31: 259 (female).
- Biology: Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 248-249. —Gregg, 1963. Ants of Colo., pp. 560-561. —Cole, 1966. Brigham Young Univ., Sci. Bul., Biol. Ser. 7: 23 (Nev. Test Site).
- integroides propinqua** Wheeler. Colo., Utah, Wash., Calif. Ecology: Found on the east slopes of the Cascades and Sierras in Wash. and Calif.; inhabits forests where nests are started under logs and stumps and considerable use is made of thatching.
- Formica truncicola integroides* var. *propinqua* Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 538. ♀.
- Taxonomy: Creighton, 1940. Amer. Mus. Novitates 1055: 6-7. —Cole, 1956. Tenn. Acad. Sci., Jour. 31: 257-259 (female, male).
- Biology: Mallis, 1941. South. Calif. Acad. Sci., Bul. 40: 88. —Gregg, 1963. Ants of Colo., pp. 562-564.
- integroides subfasciata** Wheeler. Calif. (Mill Creek Canyon, Wilson Peak, 7500 ft., San Bernardino Mtns.).
- Formica truncicola integroides* var. *subfasciata* Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 539. ♀.
- Taxonomy: Creighton, 1940. Amer. Mus. Novitates 1055: 7. —Brown, 1965. Ent. News 76: 185 (possible syn. of *integroides* Emery).
- laeviceps** Creighton. N. Dak., S. Dak., Colo., Utah. Ecology: Nests mostly in open areas under stones and logs which are banked with little debris.
- Formica rufa laeviceps* Creighton, 1940. Amer. Mus. Novitates 1055: 7, 9. ♀, ♀.
- Taxonomy: Cole, 1942. Amer. Midland Nat. 28: 377, 380 (also biological notes).
- Biology: Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 239-240. —Gregg, 1963. Ants of Colo., pp. 564-565.
- lugubris** Zetterstedt. Que.; Europe. Ecology: Populous colonies are found in large mound nests of thatch and debris in open forests. Introduced into Valcartier, Quebec in 1971 from Italy for use as a predator of the Swaine jack pine sawfly, *Neodiprion swainei* Midd. It is apparently established in Quebec.
- Formica lugubris* Zetterstedt, 1840. Ins. Lapponica, v. 1, p. 449. ♂.
- Taxonomy: Yarrow, 1955. Soc. Brit. Ent., Trans. 12: 5, 10 (synonymy, also biological notes).
- Biology: Pavan, 1959. Min. dell' Agr. e delle For. [Italy] 4: 5 (in Italy). —Pavan, 1963. Pavia Univ. Symp. Genet. et Biol. Ital. 11: 61-84 (use to protect alpine forests against insect damage). —Pavan, 1963. Pavia Univ. Symp. Genet. et Biol. Ital. 12: 122-131 (reconstruction of nest). —Klimetzek, 1970. Ztschr. f. Angew. Ent. 66: 84-95 (environmental factors and

- distribution). —Williamson, 1973. Canad. Dept. Agr., Liberation Bul. no. 36, p. 2. (in Que.). —Finnegan, 1975. Canad. Ent. 107: 1271-1274 (introduction into eastern Canada).
- mucescens* Wheeler. Colo., Utah. Ecology: Found in open areas where it nests under stones; moderate use is made of thatching.
- Formica truncicola mucescens* Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 392, 394, 442. ♀, ♀, ♂.
- Taxonomy: Creighton, 1940. Amer. Mus. Novitates 1055: 6-7. —Cole, 1942. Amer. Midland Nat. 28: 376, 380.
- Biology: Gregg, 1963. Ants of Colo., pp. 566-567.
- obscuripes** Forel. Que., Mich., Ind., Man. w. to B. C. s. to N. Mex., Utah., Calif. Ecology: Nests are found in open areas where they are usually started at the base of a plant. Extensive use is made of thatching and the finished nest is a large mound of detritus. Probably the most common thatching ant of the western states. Introduced into Quebec from Manitoba for use as a predator of the Swaine jack pine sawfly, *Neodiprion swainei* Midd.
- Formica rufa obscuripes* Forel, 1886. Soc. Ent. de Belg., Ann. (C. R.) 30: 39. ♀.
- Formica rufa obscuriventris* var. *melanotica* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 644, 650. ♀.
- Formica rufa obscuriventris* var. *rubiginosa* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 644, 650. "♀" = ♀. Preocc. by Guillou, 1841.
- Formica rufa aggerans* Wheeler, 1912. Psyche 19: 90. N. name for *rubiginosa* Emery.
- Taxonomy: Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 392, 394, 432-433 (each caste). —Creighton, 1940. Amer. Mus. Novitates 1055: 7. —Buren, 1944. Iowa State Col., Jour. Sci. 18: 300. —Wheeler and Wheeler, 1953. Ent. Soc. Amer., Ann. 46: 165-166 (larva).
- Biology: Treherne, 1915. Canad. Ent. 47: 104. —Burrill and Smith, 1919. Ohio Jour. Sci. 19: 286. —Cole, 1932. Psyche 39: 30-33. —Weber, 1935. Ecol. Monog. 5: 165-206 (in N. Dak.). —Essig, 1926. Ins. West. No. Amer., p. 867. —Eckert and Mallis, 1937. Calif. Agr. Expt. Sta. Cir. 342: 30. —Weber, 1941. Canad. Ent. 73: 140-141. —Cole, 1942. Amer. Midland Nat. 28: 380. —Wheeler and Wheeler, 1944. N. Dak. Hist. Quart. 11: 263-266. —Sallee and King, 1947. Iowa Acad. Sci., Proc. 54: 349-352. —King and Walters, 1950. Iowa Acad. Sci., Proc. 57: 469-47. —King and Sallee, 1953. Iowa Acad. Sci., Proc. 60: 656-659. —King and Sallee, 1957. Iowa Acad. Sci., Proc. 63: 721-723. —Talbot, 1959. Amer. Midland Nat. 61: 124-128 (flight activities). —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 240-244. —Gregg, 1963. Ants of Colo., pp. 566-572. —Bradley, 1972. Canad. Ent. 104: 245-249 (transplanting colonies in jack pine stands in Man.). —Talbot, 1972. Kans. Ent. Soc., Jour. 45: 254-258 (flights and swarms). —Alpert and Akre, 1973. Ent. Soc. Amer., Ann. 66: 753-760 (association with inquiline, *Leptothorax diversipilosus* Smith, in Wash.). —Williamson, 1973. Canad. Dept. Agr., Liberation Bul. no. 36, p. 2 (introduction into Que.).
- Morphology: Hung, 1969. Ent. Soc. Amer., Ann. 62: 456 (chromosome number).
- obscuriventris clivia** Creighton. Man., Wis., Iowa w. to B. C. s. to N. Mex., Utah. Ecology: Nests in forests under logs and stones; moderate use is made of thatching.
- Formica rufa clivia* Creighton, 1940. Amer. Mus. Novitates 1055: 8, 9. ♀, ♀, ♂.
- Taxonomy: Cole, 1942. Amer. Midland Nat. 28: 377. —Buren, 1944. Iowa State Col., Jour. Sci. 18: 300, 302.
- Biology: King, 1949. Iowa Acad. Sci., Proc. 56: 367-370 (mixed colony with *F. fossiceps* Buren). —King and Sallee, 1951. Iowa Acad. Sci., Proc. 58: 487-489. —King, 1955. Iowa Acad. Sci., Proc. 62: 509-513 (winged workers). —King and Sallee, 1959. Iowa Acad. Sci., Proc. 66: 472-473 (slave of *F. rubicunda* Emery). —King and Sallee, 1962. Iowa Acad. Sci., Proc. 69: 531-539 (mixed colonies with *F. fossiceps* Buren). —Gregg, 1963. Ants of Colo., pp. 574-577.
- obscuriventris obscuriventris** Mayr. Que., Maine s. to Va. w. to N. Dak., Iowa, Colo. Ecology: Nests in woods and grasslands under logs and makes moderate use of thatching.
- Formica truncicola* var. *obscuriventris* Mayr, 1870. Zool.-Bot. Gesell. Wien, Verh. 20: 951. ♀.
- Formica dryas* Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21: 268. ♀, ♀.



- Formica dryas* var. *gymnomma* Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21: 269. ♀.
- Taxonomy: Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 392, 448. —Creighton, 1940. Amer. Mus. Novitates 1055: 8.
- Biology: Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24: 623. —Wheeler, 1917. Conn. State Geol. and Nat. Hist. Survey Bul. 22: 595, 597. —Buren, 1941. Iowa State Col., Jour. Sci. 15: 115. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 244-246. —Gregg, 1963. Ants of Colo., pp. 572-574. —Talbot, 1964. Anim. Behaviour 12: 154 (nest structure and flights). —Ayre, 1968. Canad. Ent. 100: 165-172 (prey finding, capture and transport).
- oreas comptula** Wheeler. Sask., N. Dak., Iowa w. to Alta., Wash., Idaho, Utah. Ecology: Nests in wooded areas or grasslands under stones or logs banked with detritus.
- Formica oreas* var. *comptula* Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 391, 393, 460. ♀, ♀.
- Taxonomy: Cole, 1942. Amer. Midland Nat. 28: 376, 380.
- Biology: Cole, 1934. Psyche 41: 227. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 246-248.
- oreas oreas** Wheeler. Mont., Wyo., Colo., N. Mex., Utah. Ecology: Nests in open woods or meadows under rocks or logs covered with detritus. Colonies may be abundant and have sizeable mounds.
- Formica oreas* Wheeler, 1903. Amer. Mus. Nat. Hist., Bul. 19: 643. ♀, ♀, ♂.
- Taxonomy: Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 391, 393, 458-460. —Cole, 1942. Amer. Midland Nat. 28: 376, 379.
- Biology: Wheeler, 1910. Ants, pp. 114, 205, 351, 444. —Gregg, 1963. Ants of Colo., pp. 577-579.
- prociliata** Kennedy and Dennis. Ohio, Wis., Iowa. Ecology: Nests of the type specimens were under stones on ledges in open woods and lacked thatching.
- Formica prociliata* Kennedy and Dennis, 1937. Ent. Soc. Amer., Ann. 30: 531. ♀, ♀, ♂.
- Taxonomy: Buren, 1944. Iowa State Col., Jour. Sci. 18: 300, 303.
- reflexa** Buren. Que., Minn., Iowa, N. Dak. Ecology: Has only been found in association with the host; a permanent inquiline ?. Host: *Formica fusca* L.
- Formica reflexa* Buren, 1942. Iowa State Col., Jour. Sci. 16: 399. ♀, ♀, ♂.
- Taxonomy: Buren, 1944. Iowa State Col., Jour. Sci. 18: 299, 303.
- Biology: King, 1949. Iowa Acad. Sci., Proc. 56: 367-379 (mixed colony with *F. fusca*). —King, 1951. Iowa Acad. Sci., Proc. 58: 487-489. —Wheeler and Wheeler, 1963. Ants of N. Dak., p. 249-250. —Francoeur and Beique, 1968. Nat. Canad. 95: 228 (Que.).
- subnitens** Creighton. N. Dak., Wyo., Colo., N. Mex., B. C., Oreg., Calif. Ecology: Usually nests in grasslands, under stones banked with debris or in dome-shaped mounds of thatch or detritus.
- Formica rufa subnitens* Creighton, 1940. Amer. Mus. Novitates 1055: 7, 10. ♀.
- Taxonomy: Cole, 1955. Tenn. Acad. Sci., Jour. 30: 50. —Miller, 1957. Insectes Sociaux 4: 253-257 (each caste).
- Biology: Cole, 1954. Tenn. Acad. Sci., Jour. 29: 165. —Ayre, 1957. Insectes Sociaux 4: 173-176 (ecological notes). —Ayre, 1958. Insectes Sociaux 5: 1-7. —Ayre, 1958. Insectes Sociaux 5: 147-157 (meteorological factors affecting foraging). —Ayre, 1959. Insectes Sociaux 6: 105-114 (food habits). —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 250-252. —Gregg, 1963. Ants of Colo., p. 581-584.

## SPECIES GROUP MICROGYNA

Species of this group are believed to be temporary social parasites of other species of *Formica*. The female in some way is adopted by workers of the host species. Host workers may remain in the colony after the intruding queen has established her own brood, but the host workers eventually die. Most species are found in open woods or meadows. The nests are usually of the thatch type, but the thatching is normally scattered about the nest openings and appears as a flattened disc.

- Taxonomy: Letendre and Huot, 1972. Soc. Ent. Quebec, Ann. 17: 117-132 (preliminary considerations to a revision of the *microgyna* group).
- densiventris** Viereck. Colo., N. Mex., Utah w. to Calif. Ecology: Found in forests and open forests, under stones and logs; only occasionally with use of thatch.  
*Formica fusca* var. *densiventris* Viereck, 1903. Amer. Ent. Soc., Trans. 29: 74. ♀.  
*Formica microgyna rasilis* var. *spicata* Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 395, 469. ♀, ♀, ♂.  
*Formica microgyna rasilis* var. *pinetorum* Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 542. ♀.
- Taxonomy: Brown, 1947. Ent. News 58: 6-8. —Cole, 1955. Tenn. Acad. Sci., Jour. 30: 50.
- Biology: Mallis, 1941. South. Calif. Acad. Sci., Bul. 40: 85. —Cole, 1954. Tenn. Acad. Sci., Jour. 29: 165. —Gregg, 1963. Ants of Colo., pp. 589-593.
- difficilis** Emery. Mass. s. to Ga. w. to Iowa. Ecology: Nests are in woodlands, sometimes under stones, and are packed with vegetable debris. Host: *Formica pallidefulva* (Latreille).  
*Formica rufa difficilis* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 645, 651. ♀, ♀, ♂.  
*Formica difficilis* var. *consocians* Wheeler, 1904. Amer. Mus. Nat. Hist., Bul. 20: 371. ♀, ♀, ♂.  
*Formica habrogyna* Cole, 1939. Amer. Midland Nat. 22: 413. ♀, ♀.
- Taxonomy: Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 395, 477-480 (each caste). —Buren, 1944. Iowa State Col., Jour. Sci. 18: 306. —Wheeler and Wheeler, 1953. Ent. Soc. Amer., Ann. 46: 164 (larva).
- Biology: Wheeler, 1904. Amer. Mus. Nat. Hist., Bul. 20: 347-373. —Wheeler, 1906. Amer. Mus. Nat. Hist., Bul. 22: 50-64. —Wheeler, 1910. Ants, pp. 113-114, 205-206, 441-444.
- dirksi** Wing. Maine (Daigle, Aroostook Co.). Ecology: The host nest of the type queen was at the edge of a clearing under bark of a dry stump. Host: *Formica fusca* L.  
*Formica dirksi* Wing, 1949. Canad. Ent. 81: 13-15. ♀.
- impeza** Wheeler. Mass., Mich., Minn. Host: *Formica fusca* L.  
*Formica impeza* Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21: 273. ♀.
- Taxonomy: Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., bul. 53: 395-396, 472-473 (worker, female).
- Biology: Wheeler, 1906. Psyche 13: 40. —Wheeler, 1910. Ants, pp. 113, 444.
- indianensis** Cole. Ind., Iowa. Ecology: Nest was in a grassy field under a stone and was surrounded with grass debris.  
*Formica indianensis* Cole, 1940. Amer. Midland Nat. 23: 224. ♀, ♂.
- Taxonomy: Buren, 1944. Iowa State Col., Jour. Sci. 18: 300, 306.
- knighti** Buren. Iowa (Bonaparte). Ecology: Nest was in a pasture under bushes and surmounted by a low dome of plant debris.  
*Formica (Formica) knighti* Buren, 1944. Iowa State Col., Jour. Sci. 18: 300, 303-305. ♀.
- microgyna** Wheeler. Wyo., Colo., N. Mex., Utah, Nev. Ecology: Prefers meadows and open forests. Nests are usually started under stones which are piled with thatching, the thatching increasing in size as the nest grows. Host: *Formica argentea* Wheeler, *F. lasioides* Emery, *F. neogagates* Emery.  
*Formica microgyna* Wheeler, 1903. Amer. Mus. Nat. Hist., Bul. 19: 645. ♀, ♀, ♂.  
*Formica microgyna microgyna* var. *recidiva* Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 395, 467. ♀, ♂.
- Taxonomy: Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 395-396, 465-467 (each caste).
- Biology: Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 542. —Gregg, 1963. Ants of Colo., pp. 584-587. —Cole, 1966. Brigham Young Univ., Sci. Bul., Biol. Ser. 7: 24 (Nev. Test Site).
- morsei** Wheeler. Mass. (South Natick).  
*Formica morsei* Wheeler, 1906. Psyche 13: 39. ♀.
- Taxonomy: Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 394, 480-481.

**nepticula** Wheeler. Mass., Conn., Ill., Iowa. Ecology: Nests in open woods under stones or rotting limbs and are banked with vegetable debris.

*Formica nepticula* Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21: 270. ♀, ♀, ♂.

Taxonomy: Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 394, 396, 475-477 (each caste). —Wheeler, 1917. Conn. State Geol. and Nat. Hist. Survey Bul. 22: 595, 597. —Buren, 1944. Iowa State Col., Jour. Sci. 18: 30, 306.

Biology: Wheeler, 1906. Amer. Mus. Nat. Hist., Bul. 22: 64. —Wheeler, 1910. Ants, pp. 113, 205, 444.

**nevadensis** Wheeler. Nev. (Ormsby Co.). Ecology: Nests in open forests under stones and surmounted by plant debris.

*Formica microgyna* var. *nevadensis* Wheeler, 1904. Amer. Mus. Nat. Hist., Bul. 20: 373. ♀.

Taxonomy: Wheeler, 1905. Amer. Mus. Nat. Hist., Bul. 21: 272. —Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 396, 470-472 (worker). —Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 544. —Cole, 1956. Tenn. Acad. Sci., Jour. 31: 256-257 (also biology).

Biology: Wheeler, 1910. Ants, pp. 11, 444.

**postoculata** Kennedy and Dennis. Pa., Ind., Ill., Iowa. Ecology: Nest of type series from Indiana was in a pasture between two boulders and was covered with trash.

*Formica postoculata* Kennedy and Dennis, 1937. Ent. Soc. Amer., Ann. 30: 540-542. ♀.

**querquetulana** Kennedy and Dennis. New England to Ohio. Ecology: Nests found in pastures and sandy areas usually beneath objects and commonly covered with loose trash. Host:

*Formica fusca* L.

*Formica querquetulana* Kennedy and Dennis, 1937. Ent. Soc. Amer., Ann. 30: 536-540. ♀, ♀.

**rasilis** Wheeler. Colo., N. Mex., Utah northwest to Wash. Ecology: Nests in open or semi-open areas usually under stones. Host: *Formica argentea* Wheeler, *F. fusca* L. Creighton (1950) stated that there is a great deal of intergradation between *rasilis* and *spicata* (see synonymy of *densiventris*); consequently, *rasilis* and *densiventris* may be conspecific.

*Formica microgyna* var. *rasilis* Wheeler, 1903. Amer. Mus. Nat. Hist., Bul. 19: 648. ♀, ♀, ♂.

Taxonomy: Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 395-396, 468-469.

—Creighton, 1950. Harvard Univ., Mus. Comp. Zool., Bul. 104: 506-507.

Biology: Cole, 1942. Amer. Midland Nat. 28: 376, 381. —Gregg, 1963. Ants of Colo., pp. 587-589.

**scitula** Wheeler. Ga. (Clayton).

*Formica microgyna scitula* Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 395, 470. ♀.

**spatulata** Buren. Minn., Iowa, N. Dak., Mont., B. C. Ecology: Nests under stones. Host:

*Formica fusca* L.

*Formica (Formica) microgyna spatulata* Buren, 1944. Iowa State Col., Jour. Sci. 18: 300, 305. ♀, ♀, ♂.

Biology: Wheeler and Wheeler, 1963. Ants of N. Dak., p. 253.

**whymperi adamsi** Wheeler. Mich. to Minn. Ecology: Has been found in drier tamarack swamps in nests covered with leaves.

*Formica adamsi* Wheeler, 1909. N. Y. Ent. Soc., Jour. 17: 84. ♀.

*Formica adamsi* Wheeler, 1909. Mich. Geol. Survey, Bul. 5: 326. ♀.

Taxonomy: Wheeler, 1913. Harvard Univ. Mus. Comp. Zool., Bul. 53: 395, 473-474. —Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 544.

Biology: Drooz, 1960. U. S. Dept. Agr., Tech. Bul. 1212, p. 36 (predator of larch sawfly).

**whymperi alpina** Wheeler. Colo., N. Mex., Idaho, Utah. Ecology: Found at high elevations, mostly above 9,000 feet where it nests in forests under stones or rotting logs and with some plant debris or thatch around these objects. Host: *Formica neorufibarbis* Emery.

*Formica adamsi* var. *alpina* Wheeler, 1909. N. Y. Ent. Soc., Jour. 17: 85. ♀.

*Formica adamsi* var. *alpina* Wheeler, 1909. Mich. Geol. Survey, Bul. 5: 327. ♀.

Taxonomy: Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 395, 475. —Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 544.

Biology: Cole, 1954. Tenn. Acad. Sci., Jour. 29: 165-166. —Gregg, 1963. Ants of Colo., pp. 593-596 (also description of female).

**whymperi californica** Wheeler. Mont., Idaho, Wash. s. to Calif.

*Formica microgyna californica* Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 543. ♀.

*Formica microgyna californica* var. *hybrida* Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 543. ♀.

**whymperi whymperi** Forel. Mont. w. to B. C., Wash. Ecology: Nests under stones and logs which it banks with plant debris. Host: *Formica neoclara* Emery.

*Formica rufa obscuripes* var. *whymperi* Forel, 1904. Soc. Ent. de Belg., Ann. 48: 152. ♀.

*Formica microgyna rasilis* var. *pullula* Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 562. ♀, ♀.

Taxonomy: Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 392, 434. —Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 544 (also biological notes).

#### SPECIES GROUP SANGUINEA

Members of this subgenus are social parasites. Nest founding females forceably enter small colonies of the host species and kill or drive off the host workers before rearing the host brood for her own use. Hosts are other species of *Formica*. Some species are known to regularly conduct slave raids, a habit unknown in other *Formica* species.

Taxonomy: Wilson and Brown, 1955. Psyche 62: 108-129. —Buren, 1968. Ga. Ent. Soc., Jour. 3: 25-40 (key to spp.).

Biology: Wheeler, 1910. Ants, pp. 458-470. —Creighton, 1950. Harvard Univ., Mus. Comp. Zool., Bul. 104: 460-461.

**creightoni** Buren. Mich., Ill., Iowa. Host: *Formica neogagates* Emery.

*Formica (Raptiformica) creightoni* Buren, 1968. Ga. Ent. Soc., Jour. 3: 35-36. ♀.

**curiosa** Creighton. B. C., Mont., Idaho, Oreg. Host: *Formica lasioides* Emery, *F. manni* Wheeler.

*Formica curiosa* Creighton, 1935. Amer. Mus. Novitates 773: 5. ♀, ♀.

*Formica parcipappa* Cole, 1946. Ent. Soc. Amer., Ann. 36: 616. ♀.

Taxonomy: Wilson and Brown, 1955. Psyche 62: 123-125. —Buren, 1968. Ga. Ent. Soc., Jour. 3: 32-33. —Snelling, 1969. Ent. Soc. Wash., Proc. 71: 194-196 (syn. of *parcipappa*; biological notes).

**emeryi** Wheeler. Colo. (Bradmoor, Colorado Springs). Host: *Formica neogagates* Emery.

*Formica emeryi* Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 389, 419. ♀, ♀.

Taxonomy: Wilson and Brown, 1955. Psyche 62: 118 (a syn. of *subnuda*). —Gregg, 1963. Ants of Colo., pp. 606-608 (valid sp.). —Buren, 1968. Ga. Ent. Soc., Jour. 3: 34-35 (valid sp.).

**pergandei** Emery. Que., N. H. s. to N. C. w. to N. Dak., S. Dak., Iowa, Colo. Host: *Formica fusca* L., *F. pallidefulva* Latreille (?).

*Formica pergandei* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 643, 646. ♀.

*Formica sanguinea rubicunda* var. *sublucida* Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 390, 408. ♀, ♀.

Taxonomy: Buren, 1968. Ga. Ent. Soc., Jour. 3: 28-29.

Biology: Wheeler, 1901. Amer. Nat. 35: 722. —Gregg, 1946. Amer. Midland Nat. 35: 752. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 219-220. —Gregg, 1963. Ants of Colo., pp. 622-623. —Regnier and Wilson, 1971. Science 172: 267-269 (chemical communication). —Hung, 1973. Ent. News 84: 253-259 (reproductive biology). —Finnegan, 1973. Canad. Ent. 105: 441-444 (diurnal foraging activity; as *sublucida*).

- puberula** Emery. Man., N. Dak., S. Dak., Wyo., Colo., Tex. w. to B. C., Wash., Calif. Host: *Formica altipetens* Wheeler, *F. bradleyi* Wheeler, *F. fusca* L., *F. hewitti* Wheeler, *F. lasioides* Emery, *F. lepida* Wheeler, *F. montana* Emery, *F. neoclara* Emery, *F. neorufibarbis* Emery, *F. pallidefulva nitidiventris* Emery, *F. rasilis* Wheeler, *F. subpolita* Mayr.  
*Formica sanguinea puberula* Emery, 1893. Zool. Jahrb., Abt. f. System 7: 643, 648. ♀.
- Taxonomy: Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 390, 413-414 (each caste). —Cole, 1942. Amer. Midland Nat. 28: 376. —Buren, 1968. Ga. Ent. Soc., Jour. 3: 30-31.
- Biology: Wheeler, 1910. Ants, pp. 458-460. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 220-221. —Gregg, 1963. Ants of Colo., pp. 613-616. —Snelling, 1969. Ent. Soc. Wash., Proc. 71: 196-197.
- rubicunda** Emery. Ont. s. to N. C., Tenn. w. to Mont., Colo., N. Mex. Host: *Formica altipetens* Wheeler, *F. bradleyi* Wheeler, *F. fossiceps* Buren, *F. fusca* L., *F. lasioides* Emery, *F. lepida* Wheeler, *F. montana* Emery, *F. neoclara* Emery, *F. neogagates* Emery, *F. neorufibarbis* Emery, *F. obscuriventris clivia* Creighton, *F. pallidefulva nitidiventris* Emery, *F. schaufussi* Mayr.  
*Formica sanguinea rubicunda* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 643, 647. ♀, ♀.
- Taxonomy: Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 390, 406-408 (each caste). —Wheeler, 1917. Conn. State Geol. and Nat. Hist. Survey Bul. 22: 595. —Buren, 1944. Iowa State Col., Jour. Sci. 18: 299. —Buren, 1968. Ga. Ent. Soc., Jour. 3: 30.
- Biology: Wheeler, 1910. Ants, pp. 458-470. —Smith, 1928. N. Y. Ent. Soc., Jour. 26: 327-329. —Talbot, 1934. Ecology 15: 421, 430-434. —King and Sallee, 1959. Iowa Acad. Sci., Proc. 66: 472-473. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 221-223. —Gregg, 1963. Ants of Colo., pp. 616-618.
- subintegra** Emery. Newfoundland, N. S., Ont. s. to S. C., Tenn. w. to N. Dak., Iowa, Kans. Host: *Formica fusca* L., *F. lasioides* Emery, *F. montana* Emery, *F. neogagates* Emery, *F. pallidefulva nitidiventris* Emery, *F. schaufussi* Mayr, *F. subpolita* Mayr.  
*Formica sanguinea rubicunda* var. *subintegra* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 643, 648. ♀.
- Formica sanguinea subintegra* var. *gilvescens* Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 390, 412. ♀.
- Taxonomy: Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 390, 410-412. —Wheeler, 1917. Conn. State Geol. and Nat. Hist. Survey Bul. 22: 595. —Buren, 1944. Iowa State Col., Jour. Sci. 18: 299. —Wilson and Brown, 1955. Psyche 62: 120. —Buren, 1968. Ga. Ent. Soc., Jour. 3: 29-30.
- Biology: Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24: 624, 627-631. —Smith, 1928. N. Y. Ent. Soc. Jour. 36: 323-327. —Talbot and Kennedy, 1940. Ent. Soc. Amer., Ann. 33: 560-577. —Brown, 1958. Psyche 65: 39-40. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 225-227. —Kannowski, 1963. Pavia Univ., Symp. Genet. Biol. Ital. 12: 74-102 (mating behavior). —Regnier and Wilson, 1971. Science 172: 267-269 (chemical communication).
- Morphology: Hugn, 1969. Ent. Soc. Amer., Ann. 62: 456 (chromosome number).
- subnuda** Emery. Newfoundland w. to Yukon, Alaska s. to N. Y., Minn., N. Dak., Colo., N. Mex., Ariz., Calif. Host: *Formica altipetens* Wheeler, *F. fusca* L., *F. montana* Emery, *F. neorufibarbis* Emery, *F. subpolita* Mayr.  
*Formica sanguinea rubicunda* var. *subnuda* Emery, 1895. Zool. Jahrb., Abt. f. System. 8: 335. ♀.
- Formica sanguinea aserva* Forel, 1901. Soc. Ent. de Belg., Ann. 45: 395. ♀, ♀.
- Taxonomy: Wheeler, 1913. Harvard Univ., Mus. Comp. Zool., Bul. 53: 389, 404-406, 409-410 (each caste). —Wheeler, 1917. Conn. State Geol. and Nat. Hist. Survey Bul. 22: 595. —Buren, 1944. Iowa State Col., Jour. Sci. 18: 299, 308. —Wheeler and Wheeler, 1953. Ent. Soc. Amer., Ann. 46: 170 (larva). —Wilson and Brown, 1955. Psyche 62: 118. —Buren, 1968. Ga. Ent. Soc., Jour. 3: 33-34.

- Biology: Wheeler, 1906. Amer. Mus. Nat. Hist., Bul. 22: 85. —Wheeler, 1908. Amer. Mus. Nat. Hist., Bul. 24: 623, 631-633. —Wheeler, 1910. Ants, pp. 458-460, 468. —Wheeler, 1917. Harvard Univ., Mus. Comp. Zool., Bul. 61: 19. —Cole, 1942. Amer. Midland Nat. 28: 378. —Gregg, 1947. Colo. Univ. Studies 2: 393. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 223-225. —Gregg, 1963. Ants of Colo., pp. 618-621. —Chapman, 1957. Canad. Ent. 89: 392 (swarming on mountain tops). —Finnegan, 1973. Canad. Ent. 105: 441-444 (diurnal foraging activity).
- wheeleri* Creighton. N. Dak., Colo., N. Mex., Utah, Ariz. Host: *Formica altipetens* Wheeler, *F. bradleyi* Wheeler, *F. fusca* L., *F. lasioides* Emery, *F. lepida* Wheeler, *F. neogagates* Emery, *F. neorufibarbis* Emery.
- Formica wheeleri* Creighton, 1935. Amer. Mus. Novitates 773: 1-5. ♀, ♀.
- Taxonomy: Wilson and Brown, 1955. Psyche 62: 125-126. —Buren, 1968. Ga. Ent. Soc., Jour. 3: 31-32.
- Biology: Cole, 1942. Amer. Midland Nat. 28: 376, 378. —Cole, 1954. Tenn. Acad. Sci., Jour. 29: 104. —Wilson, 1955. Psyche 62: 130-133. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 227-228. —Gregg, 1963. Ants of Colo., pp. 623-625. —Halverson, et al., 1976. Kans. Ent. Soc., Jour. 49: 299 (*bradleyi* as slave).

### Genus POLYERGUS Latreille

*Polyergus* Latreille, 1804. Nouv. Dict. Hist. Nat., v. 24, p. 179.

Type-species: *Formica rufescens* Latreille. Monotypic.

The species of this genus are obligatory or true slave-making ants. In nest founding, the female enters a nest of the host species, eventually kills the rightful queen, and uses the host workers to tend her brood. A colony of *Polyergus* will conduct slave raids on nests of species of *Formica*, and workers of the host are taken and used by the *Polyergus* colony to feed and rear the brood and excavate the nest.

Revision: Smith, 1947. Amer. Midland Nat. 38: 150-161.

Taxonomy: Wheeler, 1968. Ent. Soc. Wash., Proc. 70: 156-164 (male genitalia and taxonomy).

Morphology: Forbes and Brassel, 1962. N. Y. Ent. Soc., Jour. 70: 79-87 (male genitalia and terminal segments).

*breviceps* Emery. Ont., Mich. w. to B. C. s. to Ind., Ill., Mo., Kans., N. Mex., Ariz., Calif. Host:

*Formica altipetens* Wheeler, *F. argentea* Wheeler, *F. fusca* L., *F. lepida* Wheeler, *F. montana* Emery, *F. neoclara* Emery, *F. neorufibarbis* Emery, *F. pallidifulva nitidiventris* Emery, *F. schaufussi schaufussi* Mayr, *F. subpolita* Mayr.

*Polyergus rufescens breviceps* Emery, 1893. Zool. Jahrb., Abt. f. System. 7: 666. ♀.

*Polyergus rufescens bicolor* Wasmann, 1901. Allg. Ztschr. f. Ent. 6: 369. ♀, ♀, ♂.

*Polyergus rufescens breviceps* var. *Silvestrii* Santschi, 1909. Soc. Ent. Ital., Bol. 41: 7. ♀, ♂.

*Polyergus rufescens breviceps* var. *montezuma* Wheeler, 1914. N. Y. Ent. Soc., Jour. 22: 56. ♀, ♀, ♂.

*Polyergus rufescens breviceps* var. *umbratus* Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34: 419. ♀.

*Polyergus rufescens laeviceps* Wheeler, 1915. Amer. Mus. Nat. Hist., Bul. 34: 420. ♀.

*Polyergus rufescens breviceps* var. *fusciiventris* Wheeler, 1917. Amer. Acad. Arts and Sci., Proc. 52: 555. ♀.

Taxonomy: Cole, 1942. Amer. Midland Nat. 28: 385. —Buren, 1944. Iowa State Col., Jour. Sci. 18: 310. —Smith, 1947. Amer. Midland Nat. 38: 152, 157-159, 161. —Wheeler, 1968. Ent. Soc. Wash., Proc. 70: 156-164. —Wheeler and Wheeler, 1968. Ent. Soc. Amer., Ann. 61: 214

(larva, as *rufescens*).

Biology: Wheeler, 1910. Ants, pp. 475-482. —Wheeler, 1916. N. Y. Ent. Soc., Jour. 24: 107-118.

—Smith, 1928. N. Y. Ent. Soc., Jour. 36: 329-333. —Mallis, 1941. South. Calif. Acad. Sci., Bul. 40: 82. —Wheeler and Wheeler, 1944. N. Dak. Hist. Quart. 11: 260. —Gregg, 1946.

Amer. Midland Nat. 35: 754. —Wheeler and Wheeler, 1963. Ants of N. Dak., pp. 275-277.

—Gregg, 1963. *Ants of Colo.*, pp. 635-643. —Hung, 1973. *Ent. News* 84: 253-259 (reproductive biology).

**lucidus longicornis** Smith. N. C., S. C., Ga. Host: *Formica schaufussi schaufussi* Mayr. *Polyergus lucidus longicornis* Smith, 1947. *Amer. Midland Nat.* 38: 155. ♀.

**lucidus lucidus** Mayr. Mass. s. to S. C. w. to N. Dak., Iowa, Colo., N. Mex. Host: *Formica lasioides* Emery, *F. neogagates* Emery, *F. pallidefulva nitidiventris* Emery, *F. schaufussi schaufussi* Mayr.

*Polyergus lucidus* Mayr, 1870. *Zool.-Bot. Gesell. Wien, Verh.* 20: 952. ♀.

*Polyergus lucidus montivagus* Wheeler, 1915. *Amer. Mus. Nat. Hist., Bul.* 34: 419. ♀, ♀, ♂.

Taxonomy: Mayr, 1886. *Zool.-Bot. Gesell. Wien, Verh.* 36: 424. —Buren, 1944. *Iowa State Col., Jour. Sci.* 18: 310. —Smith, 1947. *Amer. Midland Nat.* 38: 152-156. —Wheeler and Wheeler, 1968. *Ent. Soc. Amer., Ann.* 61: 214 (larva).

Biology: McCook, 1880. *Acad. Nat. Sci. Phila., Proc.* 32: 376-384. —Burrill, 1908. *N. Y. Ent. Soc., Jour.* 16: 144-151. —Wheeler, 1910. *Ants*, pp. 482-486. —Smith, 1934. *N. Y. Ent. Soc., Jour.* 42: 360-361. —Wheeler and Wheeler, 1963. *Ants of N. Dak.*, pp. 274-275. —Gregg, 1963. *Ants of Colo.*, pp. 633-635. —Talbot, 1967. *Psyche* 74: 299-313 (slave raids). —Talbot, 1968. *Psyche* 75: 46-52 (flights). —Harman, 1968. *Ent. News* 79: 217-223 (ecology, near Chicago). —Marlin, 1968. *Ill. State Acad. Sci., Trans.* 61: 207-209 (colony formation). —Marlin, 1969. *Kans. Ent. Soc., Jour.* 42: 108-115 (raiding behavior). —Marlin, 1971. *Amer. Midland Nat.* 86: 181-189 (mating, nesting, and ant enemies).

#### UNPLACED TAXA OF FORMICINAE

*Formica arenicola* Buckley, 1866. *Ent. Soc. Phila., Proc.* 6: 160. ♀. Washington, D. C.

*Formica atra* Buckley, 1866. *Ent. Soc. Phila., Proc.* 6: 159. ♀. Washington, D. C.

*Formica Connecticutensis* Buckley, 1866. *Ent. Soc. Phila., Proc.* 6: 154. ♀, ♀. Conn., N. Y., D. C.

*Formica lauta* Say, 1836. *Boston Jour. Nat. Hist.* 1: 286. ♀, ♂.

*Formica monticola* Buckley, 1866. *Ent. Soc. Phila., Proc.* 6: 157. ♀, ♀, ♂. N. Y.

*Formica Nortonii* Buckley, 1866. *Ent. Soc. Phila., Proc.* 6: 153. ♀, ♀. Conn.

*Formica Nova Anglae* Buckley, 1866. *Ent. Soc. Phila., Proc.* 6: 153. ♀, ♀. Maine.

*Formica occidentalis* Buckley, 1866. *Ent. Soc. Phila., Proc.* 6: 157. ♀, ♀. Conn., N. Y.

*Formica politurata* Buckley, 1866. *Ent. Soc. Phila., Proc.* 6: 160. ♀. Mich.

*Formica saxicola* Buckley, 1866. *Ent. Soc. Phila., Proc.* 6: 166. ♀, ♀. Buchanan Co., Tex.

*Formica semipunctata* Kirby, 1837. *Fauna Bor.-Amer.*, v. 4, p. 262. ♀. "Taken on a journey from New York to Cumberland House."

*Formica septentrionale* Buckley, 1866. *Ent. Soc. Phila., Proc.* 6: 161. ♀, ♀. Mich., Ill.

*Formica tenuissima* Buckley, 1866. *Ent. Soc. Phila., Proc.* 6: 159. ♀. Central Tex.

*Formica Virginiana* Buckley, 1866. *Ent. Soc. Phila., Proc.* 6: 159. ♀. Washington, D. C.

#### UNPLACED TAXA OF FORMICIDAE

*Formica dislocata* Say, 1836. *Boston Jour. Nat. Hist.* 1: 288. ♀, ♂.

*Formica Lincecumii* Buckley, 1866. *Ent. Soc. Phila., Proc.* 6: 163. ♀, ♀, ♂. Tex.

*Polyergus Texana* Buckley, 1866. *Ent. Soc. Phila., Proc.* 6: 170. ♀. Buchanan Co., Tex.

*Formica triangularis* Say, 1836. *Boston Jour. Nat. Hist.* 1: 288. ♀, ♂.





## Superfamily VESPOIDEA

By KARL V. KROMBEIN

Included in this superfamily are several groups with quite diverse habits. The primitive family Masaridae includes the only solitary wasps which store pollen and nectar as food for their larvae rather than paralyzed or dismembered Arthropoda. The solitary eumenid wasps store paralyzed lepidopterous or coleopterous, or rarely hymenopterous, larvae as food for their young. All of the truly social wasps belong to the family Vespidae.

**Taxonomy:** Ashmead, 1902. *Canad. Ent.* 34: 163-166, 203-210, 219-221 (keys to families and genera). — Dalla Torre, 1904. *In* Wytsman, *Gen. Ins.*, fasc. 19, pp. 1-108, 6 pls. (keys and species catalog). — Bequaert, 1928. *Ann. and Mag. Nat. Hist.* (10)2: 138-176 (notes on vespid types in British Museum). — Bequaert, 1928. *Brooklyn Ent. Soc., Bul.* 23: 53-63 (Fabricius types in Banks coll.). — Reid, 1942. *Roy. Ent. Soc. London, Trans.* 92: 285-331, 137 figs. (larval classification). — Richards, 1962. *Revisional study of masarid wasps*, pp. 3-27 (reclassification, key to subfamilies, phylogeny). — Charnley, 1973. *Buffalo Soc. Nat. Sci., Bul.* 26: 1-79 (value of propodeal orifice and male genitalia in higher classification).

**Biology:** Spradbery, 1973. *Wasps*, 408 pp., 28 pls., 131 text figs. (natural history of British Vespoidea).

## Family MASARIDAE

**Revision:** Bradley, 1922. *Calif. Univ., Pubs. Ent.* 1: 361-464, 15 pls. (N. Amer. spp.).

— Richards, 1962. *Revisional study of masarid wasps*, 294 pp., 241 figs. (species of world).

**Taxonomy:** Ashmead, 1902. *Canad. Ent.* 34: 219-221 (key to genera). — Bequaert, 1929.

*Psyche* 36: 72-76, 81-88 (generic characters, distribution, phylogeny). — Bequaert, 1929.

*Psyche* 36: 366-368 (fossil record).

**Biology:** Bequaert, 1929. *Psyche* 36: 76-80 (nesting habits, larval food).

### SUBFAMILY EUPARAGIINAE

This is the most primitive of the masarid wasps. The single included genus *Euparagia* is the only masarid known to prey upon insect larvae as food for its young.

### Genus EUPARAGIA Cresson

*Euparagia* Cresson, 1879. *Acad. Nat. Sci. Phila., Proc. (Ent. Sect.)* 6: vi.

Type-species: *Euparagia scutellaris* Cresson. Monotypic.

*Plesiomasaris* Cameron, 1904. *Amer. Ent. Soc., Trans.* 30: 266.

Type-species: *Plesiomasaris maculiceps* Cameron. Monotypic.

The species, which are all rare, are usually collected in association with *Eriogonum* and generally on dry hillsides.

Revision: Bohart, 1948. Pan-Pacific Ent. 24: 149-154.

Taxonomy: Bequaert, 1928. Ann. and Mag. Nat. Hist. (10)2: 146 (generic syn.). —Bohart, 1938. Pan-Pacific Ent. 14: 136-139 (synopsis). —Torchio, 1970. Los Angeles Co. Mus., Contrib. Sci. 202: 24-25, figs. 30-33 (larva).

**boregoensis** Bohart. Calif. (southeastern); desert species, Lower Sonoran Zone.

*Euparagia boregoensis* Bohart, 1948. Pan-Pacific Ent. 24: 152. ♂, ♀.

**desertorum** Bohart. Calif.; desert species, Lower Sonoran Zone.

*Euparagia desertorum* Bohart, 1948. Pan-Pacific Ent. 24: 151. ♂, ♀.

**platiniceps** Bohart. Calif.; desert species, Lower Sonoran Zone.

*Euparagia platiniceps* Bohart, 1938. Pan-Pacific Ent. 14: 138. ♂.

**richardsi** Bohart, n. name. Tex., n. Mex., Ariz.

*Psiloglossa simplicipes* Rohwer, 1909. Ent. News 20: 357. ♀. Preocc. in *Euparagia*.

**scutellaris** Cresson. Calif.; Transition Zone. Prey: *Ceutorhynchus* sp.; *Anthonomus* sp. Makes shallow burrows in hard ground, topped with slender curved chimneys, burrows ending in one or more cells provisioned with weevil larvae.

*Euparagia scutellaris* Cresson, 1879. Acad. Nat. Sci. Phila., Proc. (Ent. Sect.) 6: vi. ♂, ♀.

Biology: Williams, 1927. Pan-Pacific Ent. 4: 38-39 (nest and prey). —Clement and Grissell, 1968. Pan-Pacific Ent. 44: 34-37 (nest and prey).

**timberlakei** Bohart. Calif., Nev., Ariz.; desert species, L. Sonor. Zone.

*Euparagia timberlakei* Bohart, 1948. Pan-Pacific Ent. 24: 150. ♂, ♀.

#### SUBFAMILY MASARINAE

*Pseudomasaris* is the only masarine genus occurring in North America.

#### Genus PSEUDOMASARIS Ashmead

*Pseudomasaris* Ashmead, 1902. Canad. Ent. 34: 221.

Type-species: *Masaris occidentalis* Cresson. Orig. desig.

*Toryna* Bradley, 1922. Calif. Univ., Pubs. Ent. 1: 407.

Type-species: *Masaris vespoides* Cresson. Orig. desig.

*Holopticus* Bradley, 1922. Calif. Univ., Pubs. Ent. 1: 408.

Type-species: *Masaris texanus* Cresson. Orig. desig.

*Cotyledon* Bradley, 1922. Calif. Univ., Pubs. Ent. 1: 408.

Type-species: *Masaris edwardsii* Cresson. Orig. desig.

Nests are made of sand and mud, or mud alone, and are built on the upper or lower surfaces of stones or on twigs. Typically, they occur in clumps, and are provisioned with pollen and nectar. It appears that earlier flower records indicating that *Pseudomasaris* species are polytropic, visiting a wide range of flowers, may be erroneous. More recent investigations suggest that at least some of the species are oligotrophic, visiting only a small number of closely related plants for pollen and nectar.

Revision: Richards, 1963. Calif. Univ., Pubs. Ent. 27: 283-310, 3 pls., 26 text figs.

Taxonomy: Richards, 1962. Revisional study of masarid wasps, pp. 276-281, figs. 236-241 (key to spp., generic synonymy). —Richards, 1966. Roy. Ent. Soc. London, Proc. 35: 47-55 (revised key).

Biology: Cooper and Bequaert, 1951 (1950). Psyche 57: 137-142 (flower visiting records).

—Cooper, 1952. Amer. Midland Nat. 48: 103-110 (oligotropy, flower visiting records).

—Torchio, 1970. Los Angeles Co. Mus., Contrib. Sci. 202: 25-27 (nests).

**basirufus** Rohwer. Ariz., Calif. Pollen: *Phacelia crenulata*, *P. pachyphylla*.

*Pseudomasaris zonalis basirufus* Rohwer, 1912. U. S. Natl. Mus., Proc. 41: 452. ♀.

*Pseudomasaris bariscipus* Bradley, 1922. Calif. Univ., Pubs. Ent. 1: 418. ♂.

Taxonomy: Richards, 1963. Calif. Univ., Pubs. Ent. 27: 299 (synonymy).

**coquilletti** Rohwer. Ariz., Utah, Calif., Oreg. in U. Sonoran and Transition Zones. Ecology: Builds mud nest of 2-5 cells on rocks. Parasite: *Anthrax i. irroratus* Say. Pollen: *Phacelia distans*, *P. californica*, *P. imbricata*, *P. ramosissima*, *P. cicutaria*; *Ceanothus* sp.; *Eriodictyon* sp.; *Eschscholtzia* sp.  
*Pseudomasaris coquilletti* Rohwer, 1911. U. S. Natl. Mus., Proc. 40: 555. ♂, ♀.

Biology: Richards, 1963. Calif. Univ., Pubs. Ent. 27: 295, pls. 1-3 (nest).

**edwardsii** (Cresson). Wash., Idaho and Wyo., south to Calif. and Ariz., mostly in Transition Zone; Mexico (Baja California). Ecology: Builds mud nests of 1-10 cells attached to rocks, usually in somewhat sheltered sites. Parasite: *Chrysura densa* (Cr.). Pollen: *Eriodictyon tomentosum*; *Phacelia distans*, *P. crenulata*, *P. imbricata*, *P. hastata*, *P.* sp.; *Ceanothus parviflorus*, *C.* sp.; *Tamarix gallica*; *Oenothera clavaeformis* var. *aurantiaca*, *O.* sp.; *Mentha pulegium*, *Salvia columbariae*; *Cryptantha intermedia*, *C. muricata*, *Symphoricarpos* sp.; *Chaenactis glabriuscula*; *Eriodictyon trichocalyx* var. *lanatum*. Predator: *Philanthus zebratus nitens* (Bks.).  
*Masaris edwardsii* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 87. ♂, ♀.

Taxonomy: Torchio, 1970. Los Angeles Co. Mus., Contrib. Sci. 202: 23-24, figs. 26-29 (larva, pupa).

Biology: Hicks, 1929. Canad. Ent. 61: 121-123 (nest). —Torchio, 1970. Los Angeles Co. Mus., Contrib. Sci. 202: 2-20, figs. 1-23, 25 (nest, foraging, larval development).

**macneilli** Bohart. Calif., Utah Pollen: *Hydrophyllum occidentale*.

*Pseudomasaris macneilli* Bohart, 1963. In Richards, Calif. Univ., Pubs. Ent. 27: 291. ♂, ♀.

**macswaini** Bohart. Southern Calif. Pollen: *Phacelia* sp.

*Pseudomasaris macswaini* Bohart, 1963. In Richards, Calif. Univ., Pubs. Ent. 27: 301. ♂, ♀.

**maculifrons** (Fox). Calif., Nev., Utah, Ariz., N. Mex.; Mexico (Sonora, Baja California).

Ecology: Builds delicate tubular mud cells on under surface of stones. Pollen: *Phacelia ramosissima*, *P. crenulata*, *P. distans*, *P. congesta* var. *rupestris*, *P. pachyphylla*, *P.* sp.; *Prunus* sp.; *Astragalus* sp.; *Sphaeralcea* sp.; *Eucnide urens*; *Cryptantha* sp.

*Masaris maculifrons* Fox, 1894. Calif. Acad. Sci., Proc. (2) 4: 12. ♀.

*Pseudomasaris albifrons* Rohwer, 1912. U. S. Natl. Mus., Proc. 41: 451. ♂.

*Pseudomasaris zonalis neomexicanus* Rohwer, 1912. U. S. Natl. Mus., Proc. 41: 452. ♀.

*Pseudomasaris (Holopticus) rohweri* Bradley, 1922. Calif. Univ., Pubs. Ent. 1: 417. ♂.

Taxonomy: Richards, 1963. Calif. Univ., Pubs. Ent. 27: 297 (synonymy).

Biology: Parker, 1967. Pan-Pacific Ent. 43: 213-214, figs. b, c, e, f (nest, life history).

**marginalis** (Cresson). B. C. and Alta. south to Calif. and N. Mex. in Canadian, Transition and U. Sonoran Zones. Pollen: *Phacelia heterophylla*, *P. sericea*, *P.* sp.

*Masaris marginalis* Cresson, 1864. Ent. Soc. Phila., Proc. 3: 677. ♀.

**micheneri** Bohart. Calif. (Inyo Co.).

*Pseudomasaris micheneri* Bohart, 1963. In Richards, Univ. Calif., Pubs. Ent. 27: 298, figs. 1, 14, 21. ♂, ♀.

**occidentalis** (Cresson). Tex., Kans., N. Mex.

*Masaris occidentalis* Cresson, 1871. Amer. Ent. Soc., Trans. 3: 348. ♀.

**phaceliae** Rohwer. Tex., N. Mex., Ariz. Ecology: Builds nests under or on side of stones.

Pollen: *Phacelia congesta* var. *rupestris*, *P. popei* var. *similis*, *P. neomexicana*, *P.* sp.

*Pseudomasaris phaceliae* Rohwer, 1912. U. S. Natl. Mus., Proc. 41: 450. ♂, ♀.

Taxonomy: Richards, 1966. Roy. Ent. Soc. London, Proc. 35: 49 (redescription male, female).

Biology: Parker, 1967. Pan-Pacific Ent. 43: 214-215, fig. a (nest). —Torchio, 1970. Los Angeles Co. Mus., Contrib. Sci. 202: 21 (nest).

**texanus** (Cresson). Tex. Pollen: *Phacelia popei*.

*Masaris texanus* Cresson, 1871. Amer. Ent. Soc., Trans. 3: 348. ♂, ♀.

Taxonomy: Richards, 1966. Roy. Ent. Soc. London, Trans. 35: 48-49 (redescription male, female; clarification of distribution).

**vespoides** (Cresson). Wash. to S. Dak. south to Calif. and N. Mex. in Transition and U. Sonoran Zones; Mexico (Baja California). Ecology: Builds nest of hard mud with 1-13 cells placed vertically with tops in a straight line, or occasionally of sandy material on twigs. Pollen: *Penstemon secundiflorus*, *P. heterophyllus*, *P. alpinus*, *P. unilateralis*, *P. azurea*, *P. glaber*, *P. comarrhenus*, *P. payetensis*, *P. cyaneus*, *P. venustus*, *P. spectabilis*, *P. laetus*, *P. lyalli*, *P. attenuatus*, *P. gracilis*, *P. sp.*; *Salvia carduacea*; *Ranunculus* sp.; *Platystemon californicum*; *Clarkia* sp.; *Nama parryi*; *Phacelia* sp.; *Aster* sp., thistle. *Masaris vespoides* Cresson, 1863. Ent. Soc. Phila., Proc. 2: 287. ♂, ♀. *Pseudomasaris vespoides robertsoni* Cockerell, 1913. Ent. Soc. Wash., Proc. 15: 107. ♀.

Biology: Cockerell, 1913. Ent. Soc. Wash., Proc. 15: 107 (nest on stem). —Davidson, 1913. South. Calif. Acad. Sci., Bul. 12: 17-18 (nests on rocks and stems). —Hicks, 1927. Canad. Ent. 59: 75-79 (nests on rock). —Hicks, 1929. Canad. Ent. 61: 123-125 (behavior on flowers, nests on rocks and plant stems). —Cooper, 1952. Amer. Midland Nat. 48: 103-110 (*vespoides* probably oligolectic on *Penstemon* spp.). —Torchio, 1970. Los Angeles Co. Mus., Contrib. Sci. 202: 21, fig. 24 (nest on peach twig). —Torchio, 1974. Pan-Pacific Ent. 50: 226-234, 1 fig. (pollination mechanism in *Penstemon*).

**wheeleri** Bequaert. Calif. in Transition and U. Sonoran Zones; Mexico (Baja California). Pollen: *Eriodictyon tomentosum*, *E. crassifolium*, *E. californicum*, *E. trichocalyx* var. *lanatum*, *E. sp.*; *Penstemon spectabilis*, *P. sp.*; *Yucca* sp.; *Hyptis emoryi*; *Larrea glutinosa*; *Peucephyllum schottii*.

*Pseudomasaris wheeleri* Bequaert, 1929. Psyche 36: 61. ♂, ♀.

**zonalis** (Cresson). B. C., Wash. to Mont. and Nebr., south to Calif. and Colo. in Transition, Canadian and Hudsonian Zones. Ecology: Nest of 4 cells beneath rock overhang, the entrance upward, the cells of sandy matrix covered with hard mud. Parasite: *Chrysura densa* (Cr.). Pollen: *Phacelia heterophylla*, *P. frigida*, *P. hastata*, *P. humilis*, *P. nemoralis*, *P. sp.*; *Besseyia plantaginea*; *Ranunculus* sp.; *Ceanothus parviflorus*; *Penstemon* sp.; *Arnica* sp.; *Encelia farinosa*, *Grindelia* sp.

*Masaris zonalis* Cresson, 1864. Ent. Soc. Phila., Proc. 3: 674. ♂, ♀.

*Pseudomasaris zonalis albopictus* Bohart, 1950. Biol. Soc. Wash., Proc. 63: 78. ♂, ♀.

Taxonomy: Richards, 1963. Calif. Univ., Pubs. Ent. 27: 292 (synonymy).

Biology: Parker, 1967. Pan-Pacific Ent. 43: 215-216, fig. c (nest).

## Family EUMENIDAE

The arrangement of genera adopted here is that used by van der Vecht and Fischer for the Palaearctic fauna with interpolation in the appropriate position of the genera restricted to North America or to the New World.

Taxonomy: Ashmead, 1902. Canad. Ent. 34: 203-210 (key to genera). —Isely, 1917. Ent. Soc. Amer., Ann. 10: 364-366 (synopsis of N. Amer. spp.). —Bohart, 1939. Pan-Pacific Ent. 15: 97-98 (key to *Odynerus*, sens. lat. subgenera). —Bohart, 1965. Pan-Pacific Ent. 41: 107-113 (status of spp. described by Cameron). —Parker, 1966. Ent. Soc. Amer., Misc. Pub. 5: 173-174 (key to genera). —van der Vecht and Fischer, 1972. Hym. Cat. 8: 1-199 (Palaearctic spp.). —Goodpasture, 1974. Kans. Ent. Soc., Jour. 47: 364-372, 9 figs. (use of chromosomes in classification).

Biology: Krombein, 1961. Wash. Acad. Sci., Jour. 51: 89-93, 6 figs. (symbiosis between saprogllyphid mites and eumenid wasps). —Cooper, 1967 (1966). Psyche 73: 238-250, 11 figs. (egg hatch, number of instars, adult emergence from nest).

### SUBFAMILY EUMENINAE

#### Genus ODYNERUS Latreille

##### Genus ODYNERUS Subgenus ODYNERUS Latreille

*Odynerus* Latreille, 1802-1803. Hist. Nat. Crust. Ins., v. 3, p. 362.

Type-species: *Vespa spinipes* Linnaeus. Desig. by Shuckard, 1837. *Odynera* Illiger, 1807. Mag. Insektenk. 6: 196. Emend.

*Epipone* Kirby and Spence, 1815. Introduct. to Ent., v. 1, p. 349. Preocc.

Type-species: *Vespa spinipes* Linnaeus. Monotypic.

*Oplopus* Wesmael, 1836. Acad. Sci. Belg., Bul. 3: 45. Preocc.

Type-species: *Vespa spinipes* Linnaeus. Desig. by Girard, 1879.

*Oplomerus* Westwood, 1840. Introduct. Mod. Class. Ins., v. 2 (Synopsis), p. 84. N. name.

*Hoplomerus* Agassiz, 1846. Nomencl. Zool., Index Univ., p. 185. Emend.

*Hoplopus* Agassiz, 1846. Nomencl. Zool., Index Univ., p. 186. Preocc. Emend.

*Epiponus* Saussure, 1875. Smithsn. Inst. Misc. Collect. 254: 363.

Type-species: *Odynerus dilectus* Saussure. Monotypic.

*Euepipona* Dalla Torre, 1904. In Wytsman, Gen. Ins., fasc. 19, p. 39.

Type-species: *Vespa spinipes* Linnaeus. Desig. by Richards, 1937.

The nests are usually made in the ground but *O. erythrogaster* utilizes twigs of elderberry (*Sambucus*).

Revision: Bohart, 1939. Pan-Pacific Ent. 15: 76-84 (N. Amer. spp.)

Taxonomy: Richards and van der Vecht, 1968. Ent. Ber. 28: 196 (type-species of *Odynerus*).

*cinnabarinus* Bohart. Calif., Ariz., Utah, Tex. in U. Sonor. Zone.

*Odynerus cinnabarinus* Bohart, 1939. Pan-Pacific Ent. 15: 83. ♂, ♀.

*dilectus* Saussure. N. Y., Minn., Mont., Wyo., Colo., N. Mex., Calif., Wash., Alaska, Alta. in Canadian Zone. Ecology: Nests in ground burrows topped by erect turrets fashioned of mud pellets. Prey: *Hypera postica* (Gyll.), *H. punctata* F., larvae; caterpillars.

*Odynerus (Epipona) dilectus* Saussure, 1870. Rev. Mag. Zool. (2) 22: 141. ♂.

Biology: Linsley and Michener, 1942. Pan-Pacific Ent. 18: 27 (nest, prey).

*erythrogaster* Bohart. Calif. in U. Sonor. and Transit. Zones; Mexico (Baja California).

Ecology: Nests in *Sambucus* twigs. Parasite: Sarcophagidae sp.; *Sphaerophthalma (Photopsis)* sp. Predator: *Trichodes ornatus* Say.

*Monobia bicolor* Provancher, 1888. Addit. Corr. Faune Ent. Canada Hym., p. 421. ♀.

Preocc. in *Odynerus*.

*Odynerus erythrogaster* Bohart, 1939. Pan-Pacific Ent. 15: 81. ♂, ♀. N. name.

Biology: Parker and Bohart, 1968. Pan-Pacific Ent. 44: 3 (nest, parasites, predator).

*margaretellus* Rohwer. Colo., Oreg., Wash.

*Odynerus margaretellus* Rohwer, 1915. U. S. Natl. Mus., Proc. 49: 242. ♂, ♀.

### Genus PTEROCHEILUS Klug

The species are all ground nesting so far as is known and carry earth from their nests in "baskets" formed by the long, fringed labial palpi. Caterpillars are used in provisioning.

Revision: Bohart, 1940. Ent. Soc. Amer., Ann. 33: 162-208.

Taxonomy: van der Vecht, 1966. Ent. Ber. 26: 161-162 (type-species of *Pterocheilus* and *Nannopterocheilus*).

### Genus PTEROCHEILUS Subgenus PTEROCHEILUS Klug

*Pterocheilus* Klug, 1805. Beitr. z. Naturkunde, v. 1, p. 143.

Type-species: *Vespa phalerata* Panzer. Desig. by Blanchard, 1840.

*Nannopterocheilus* Bluethgen, 1961. Akad. Wiss. Berlin, Abhandl. 1961: 62.

Type-species: *Vespa phalerata* Panzer. Orig. desig.

The typical subgenus does not occur in the New World.

### Genus PTEROCHEILUS Subgenus MEGAPTEROCHEILUS Bohart

*Pterocheilus* subg. *Megapterocheilus* Bohart, 1940. Ent. Soc. Amer., Ann. 33: 173.

Type-species: *Pterochilus mirandus* Cresson. Orig. desig.

This subgenus may be a synonym of *Cephalochilus* Bluethgen, 1939, which van der Vecht considers to be of generic rank. Bohart noted that the Palaearctic *grandis* Lep. might belong to *Megapterocheilus*; it is the type-species of *Cephalochilus*.

- arizonicus** Bohart. Calif., Nev., Ariz., N. Mex., Tex. in L. Sonor. Zone deserts.  
*Pterochilus* (*Megapterochilus*) *arizonicus* Bohart, 1940. Ent. Soc. Amer., Ann. 33: 174. ♂, ♀.
- biplagiatus** Cresson. Calif., Wash., Wyo. in U. Sonor. and Transit. Zones. Usually collected at *Phacelia*.  
*Pterochilus* (!) *biplagiatus* Cresson, 1879. Amer. Ent. Soc., Trans. 7: Proc., p. xix. ♀ (♂ misdet.).
- bradleyi** Bohart. Ariz. (Nogales); Mexico (Sonora).  
*Pterochilus* (*Megapterochilus*) *bradleyi* Bohart, 1950. Biol. Soc. Wash., Proc. 63: 195. ♂, ♀ (?).
- crispicornis** Bohart. Calif., Nev., Utah, Ariz. in L. Sonor. Zone.  
*Pterochilus* (*Megapterochilus*) *crispicornis* Bohart, 1940. Ent. Soc. Amer., Ann. 33: 178. ♂, ♀.
- decorus decorus** Cresson. Oreg., Mont., Wyo., Colo., Nebr., Ariz., Utah, Nev., Calif. in Canadian and Transition Zones.  
*Pterochilus* (!) *decorus* Cresson, 1879. Amer. Ent. Soc., Trans. 7: Proc., p. xviii. ♀.  
*Pterochilus* (!) *zonatus* Cresson, 1879. Amer. Ent. Soc., Trans. 7: Proc., p. xviii.  
*Odynerus* (*Pachodynerus*) *cosmiogaster* Cameron, 1905. Invertebrata Pacifica 1: 123. ♂.
- decorus leucotaenius** Rohwer. Alta., Wash., Oreg., Calif., Nev., Wyo., in Transition and Canadian Zones.  
*Pterochilus* (!) *leucotaenius* Rohwer, 1911. U. S. Natl. Mus., Proc. 40: 554. ♀.
- denticulatus** (Saussure). Ariz., N. Mex.; Mexico.  
*Leptochilus denticulatus* Saussure, 1855. Rev. Mag. Zool. (2) 7: 373. ♂.  
*Pterochilus* (!) *lewisii* Cresson, 1868. Amer. Ent. Soc., Trans. 1: 382. ♀.  
*Pterochilus* (!) *aztecus* Saussure, 1870. Rev. Mag. Zool. (2) 22: 141. ♀.
- linsleyi** Bohart. Western Tex., Ariz.; Mexico (Nuevo Leon).  
*Pterochilus* (*Megapterochilus*) *linsleyi* Bohart, 1940. Ent. Soc. Amer., Ann. 33: 176. ♂, ♀.
- mirandus** Cresson. Utah, Nev., Calif. in U. Sonor. and Transit. Zones.  
*Pterochilus* (!) *mirandus* Cresson, 1879. Amer. Ent. Soc., Trans. 7: Proc., p. xvii. ♂, ♀.  
*Pterochilus* (!) *luteicollis* Cameron, 1909. Pomona Col. Jour. Ent. 1: 84. ♀.
- nigricaudus** Bohart. Calif., Ariz., Nev.  
*Pterochilus* (*Megapterochilus*) *nigricaudus* Bohart, 1940. Ent. Soc. Amer., Ann. 33: 181. ♀.  
*Pterochilus* (*Megapterochilus*) *inyoensis* Bohart, 1940. Ent. Soc. Amer., Ann. 33: 186. ♂.
- oregonensis** Bohart. Oreg. (Lakeview, Lake Co.).  
*Pterochilus* (*Megapterochilus*) *oregonensis* Bohart, 1940. Ent. Soc. Amer., Ann. 33: 182. ♀.
- pedicellatus** Bohart. Idaho, Calif., Ariz., Utah, Colo., N. Mex., Tex. in U. Sonoran Zone; Mexico.  
*Pterochilus* (*Megapterochilus*) *pedicellatus* Bohart, 1940. Ent. Soc. Amer., Ann. 33: 188. ♂, ♀.
- quinquefasciatus** Say. B. C. Alta., Wash., Oreg., Idaho, Mont., Wyo., S. Dak. to Tex., N. Mex.  
 Ecology: Nests in sand; the obliquely vertical burrow is divided into two horizontal galleries ending in 1-3 cells. Prey: Noctuidae sp.  
*Pterochilus* (!) *5-fasciatus* Say, 1824. In Keating, Narr. Long's 2nd Exped., v. 2, p. 347. ♀.  
 Biology: Isely, 1914. Kans. Univ. Sci. Bul. 8: 294-296, pl. 26, fig. 1 (nest, prey).
- texanus** Cresson. Tex., Fla., N. C. Ecology: Constructs 1-celled nest at end of vertical burrow in sandy soil. Prey: *Heliophana mitis* Grt.  
*Pterochilus* (!) *texanus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 244. ♂, ♀.  
 Biology: Evans, 1956. Ent. Soc. Wash., Proc. 58: 265-267, figs. 5, 6 (nest, prey).
- trichogaster** Bohart. Calif., Oreg. in Transition Zone. Ecology: Nests in sandy soil in aggregations. Parasite: *Fedtschenkia anthracina* (Ashm.). Prey: *Hydriomena* sp.  
*Pterochilus* (*Megapterochilus*) *trichogaster* Bohart, 1940. Ent. Soc. Amer., Ann. 33: 183. ♂, ♀.  
 Biology: Bohart and Schuster, 1972. Pan-Pacific Ent. 48: 149 (nesting habits, prey, parasite).

**Genus PTEROCHEILUS Subgenus ONCHOPTEROCHEILUS Bohart**

*Pterocheilus* subg. *Onchopterocheilus* Bohart, 1940. Ent. Soc. Amer., Ann. 33: 191.

Type-species: *Pterochilus* (!) *comptus* Cresson. Orig. desig.

**bakeri** Cameron. Calif. in Transit. Zone from San Diego Co. to Butte Co.; Mexico (Baja California).

*Pterochilus* (!) *bakeri* Cameron, 1909. Pomona Col. Jour. Ent. 1: 123. ♀.

**comptus** Cresson. Calif. in L. Sonor., U. Sonor., and Transit. Zones.

*Pterochilus* (!) *comptus* Cresson, 1879. Amer. Ent. Soc., Trans. 7: Proc., p. xviii. ♀.

**hirsutipennis** Bohart. Calif., Nev., Ariz. in deserts in L. Sonoran Zone; Mexico (Baja California).

*Pterocheilus* (*Onchopterocheilus*) *hirsutipennis* Bohart, 1940. Ent. Soc. Amer., Ann. 33: 200. ♂, ♀.

**hurdi** Bohart. Calif., Nev.

*Pterocheilus* (*Onchopterocheilus*) *hurdi* Bohart, 1950. Biol. Soc. Wash., Proc. 63: 197. ♂, ♀.

**laticeps** Cresson. Tex., Ariz., Calif. (Owens Valley and southern deserts) in L. Sonoran Zone; Mexico (Baja California, Sonora, Chihuahua, Coahuila, Durango).

*Pterochilus* (!) *laticeps* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 244. ♀.

*Odynerus leucospilus* Cameron, 1909. Pomona Col. Jour. Ent. 1: 133. ♀. Preocc.

**micheneri** Bohart. Calif., Nev., Utah, Idaho.

*Pterocheilus* (*Onchopterocheilus*) *micheneri* Bohart, 1940. Ent. Soc. Amer., Ann. 33: 196. ♂, ♀.

**panamintensis** Bohart. Calif., Ariz.

*Pterocheilus* (*Onchopterocheilus*) *panamintensis* Bohart, 1940. Ent. Soc. Amer., Ann. 33: 192. ♂.

**pimorum** (Viereck). Southern Calif., Nev., Ariz. in deserts, in L. Sonoran Zone; Mexico (Baja California).

*Odynerus pimorum* Viereck, 1908. Amer. Ent. Soc., Trans. 33: 405. ♂.

**sculleni** Bohart. Ariz., Colo., Tex.

*Pterocheilus* (*Onchopterocheilus*) *sculleni* Bohart, 1950. Biol. Soc. Wash., Proc. 63: 196. ♂, ♀.

**timberlakei** Bohart. Calif. in U. Sonoran and Transition Zones north to Eldorado Co., Ariz.

*Pterocheilus* (*Onchopterocheilus*) *timberlakei* Bohart, 1940. Ent. Soc. Amer., Ann. 33: 194. ♂, ♀.

**trachysomus** Bohart. Calif. in L. Sonoran Zone of southern deserts and Owens Valley.

*Pterocheilus* (*Onchopterocheilus*) *trachysomus* Bohart, 1940. Ent. Soc. Amer., Ann. 33: 193. ♂ (♀ misdet.).

**Genus PTEROCHEILUS Subgenus MICROPTEROCHEILUS Bohart**

*Pterocheilus* subg. *Micropterocheilus* Bohart, 1940. Ent. Soc. Amer., Ann. 33: 201.

Type-species: *Pterocheilus desertorum* Bohart. Orig. desig.

**aciceps** Bohart. Calif., Wyo.

*Pterocheilus* (*Micropterocheilus*) *aciceps* Bohart, 1940. Ent. Soc. Amer., Ann. 33: 208. ♀.

**cyathopus** Bohart. Calif. in Transition Zone.

*Pterocheilus* (*Micropterocheilus*) *flavobalteatus cyathopus* Bohart, 1940. Ent. Soc. Amer., Ann. 33: 206. ♂, ♀.

**desertorum** Bohart. Wash., Calif., Nev., Ariz., N. Mex. in L. Sonoran Zone.

*Pterocheilus* (*Micropterocheilus*) *desertorum* Bohart, 1940. Ent. Soc. Amer., Ann. 33: 202. ♂, ♀.

**diversicolor** Rohwer. Southern Calif., Nev., Ariz. in Desert of L. Sonoran Zone; Mexico (Baja California).

*Pterochilus* (!) *diversicolor* Rohwer, 1911. U. S. Natl. Mus., Proc. 40: 554. ♀.

**morrisoni** Cresson. Oreg., Calif., Nev., Utah, Ariz. in Transition, Canadian and Hudsonian Zones.

*Pterochilus* (!) *morrisoni* Cresson, 1879. Amer. Ent. Soc., Trans. 7: Proc., p. xix. ♂, ♀.

*Pterochilus* (!) *flavobalteatus* Cameron, 1909. Pomona Col. Jour. Ent. 1: 84. ♀.

Taxonomy: Bohart, 1965. Pan-Pacific Ent. 41: 109 (synonymy).

**paenacuceps** Bohart. Wyo., Idaho, Utah.

*Pterochilus (Micropterocheilus) paenacuceps* Bohart, 1950. Biol. Soc. Wash., Proc. 63: 200. ♀.

**provancheri albotinctus** Bohart. Calif., Oreg., Wash., Wyo., Nev.

*Pterochilus (Micropterocheilus) provancheri albotinctus* Bohart, 1950. Biol. Soc. Wash., Proc. 63: 199. ♂, ♀.

**provancheri provancheri** (Huard). Calif., Nev., Oreg., Utah, Transition to Canadian and Hudsonian Zones.

*Odynerus truncatus* Provancher, 1895. Nat. Canad. 22: 158. ♂, ♀. Preocc.

*Odynerus provancheri* Huard, 1897. Nat. Canad. 24: 25. N. name.

*Leptochilus cratocerus* Cameron, 1909. Pomona Col. Jour. Ent. 1: 122. ♂.

**pruinus** Cameron. Ariz., Idaho in Transition Zone.

*Pterochilus (!) pruinus* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 227. ♀.

**seneconis** Rohwer. Colo., Wyo., Mont., Idaho, Nev. in Canadian Zone.

*Pterochilus (!) seneconis* Rohwer, 1911. U. S. Natl. Mus., Proc. 40: 553. ♂, ♀.

**sparsipunctatus** Bohart. Calif.

*Pterochilus (Micropterocheilus) sparsipunctatus* Bohart, 1950. Biol. Soc. Wash., Proc. 63: 198. ♂, ♀.

**tricoloratus** Bohart. Ariz. (Maricopa Co.), Calif. (San Bernardino Co.).

*Pterochilus (Micropterocheilus) tricoloratus* Bohart, 1940. Ent. Soc. Amer., Ann. 33: 207. ♀.

### Genus LEPTOCHILOIDES Bohart

*Leptochiloides* Bohart, 1940. Ent. Soc. Amer., Ann. 33: 165.

Type-species: *Leptochiloides utahensis* Bohart. Orig. desig.

**arizonae** Bohart. Ariz.

*Leptochiloides arizonae* Bohart, 1940. Ent. Soc. Amer., Ann. 33: 166. ♂.

**brevicornis** Bohart. South. Calif.

*Leptochiloides brevicornis* Bohart, 1940. Ent. Soc. Amer., Ann. 33: 167. ♂.

**utahensis** Bohart. Utah (Bellevue, Washington Co.).

*Leptochiloides utahensis* Bohart, 1940. Ent. Soc. Amer., Ann. 33: 166. ♀.

### Genus HYPALASTOROIDES Saussure

*Hypalastoroides* Saussure, 1856. Etudes sur la famille des Vespides, v. 3, p. 328. Proposed originally as a division of *Alastor* subg. *Alastoroides* Sauss.; validated by Op. 189, Internatl. Comn. Zool. Nomencl., 1970.

Type-species: *Alastor brasiliensis* Saussure. Monotypic.

Revision: Bohart, 1948. Calif. Acad. Sci., Proc. (4) 24: 322-323.

Taxonomy: van der Vecht, 1967. Bul. Zool. Nomencl. 24: 31 (request for validation of

*Hypalastoroides* Sauss., 1856). — Internatl. Comn. Zool. Nomencl., 1970. Bul. Zool. Nomencl. 26: 187 (validation of *Hypalastoroides* Sauss., type-species *Alastor brasiliensis* Sauss.).

**mexicanus** (Saussure). Southern Tex.; Mexico to Canal Zone.

*Alastor (Alastoroides) mexicanus* Saussure, 1870. Rev. Mag. Zool. (2) 22: 141. ♀.

**slevini** (Bohart). Ariz. (Baboquivari Mts.); Mexico (Baja California).

*Alastoroides slevini* Bohart, 1948. Calif. Acad. Sci., Proc. (4) 24: 323. ♂, ♀.

### Genus MICRODYNERUS Thomson

*Microdynerus* Thomson, 1874. Hym. Scand., v. 3, p. 58.

Type-species: *Odynerus exilis* Herrich-Schaeffer. Desig. by Jones, 1937.

Two North American species have been reared from nests in twigs; both species stored caterpillars as prey. A few Palaearctic species have been reported to nest in cavities in plants, walls or rocks, and to provision with larvae of small Curculionidae.



- Taxonomy: Bohart, 1955. Ent. Soc. Wash., Proc. 57: 287-299, 19 figs. (review of trinodus group). — Parker, 1970. Pan-Pacific Ent. 46: 241-253, 52 figs. (key).
- arenicolus** (Bohart). Calif., Ariz., N. Mex.  
*Leptochilus arenicolus* Bohart, 1955. Ent. Soc. Wash., Proc. 57: 299, fig. 19. ♂, ♀.
- bakerianus** (Cameron). Oreg., Calif., Nev., Utah, Ariz., N. Mex., Colo., Wyo. Ecology: Nests in *Sambucus* stems. Parasite: *Toxophora virgata* O. S., *Anthrax irroratus* Say; *Chrysis parkeri* Moore, *C. pattoni* Aar., *C. stenodyneri* Krom.; Mutillidae sp. Prey: Lepidoptera larvae. Predator: *Trichodes ornatus* Say.  
*Ancistrocerus bakerianus* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 220. ♂.  
*Leptochilus occidentalis* Bohart, 1955. Ent. Soc. Wash., Proc. 57: 291, figs. 3, 8, 10. ♂, ♀.
- Taxonomy: Bohart, 1965. Pan-Pacific Ent. 41: 108 (synonymy).
- Biology: Parker and Bohart, 1968. Pan-Pacific Ent. 44: 3 (parasites, predator). — Parker, 1970. Pan-Pacific Ent. 46: 242-243, figs. 51, 52 (nest, life history).
- bechteli** (Bohart). Calif., Ariz.; deserts.  
*Leptochilus bechteli* Bohart, 1955. Ent. Soc. Wash., Proc. 57: 294, figs. 1, 12. ♂, ♀.
- cavatus** (Bohart). South. Calif.  
*Leptochilus cavatus* Bohart, 1955. Ent. Soc. Wash., Proc. 57: 295, fig. 13. ♂, ♀.
- gibboceps** (Bohart). Calif.  
*Leptochilus gibboceps* Bohart, 1955. Ent. Soc. Wash., Proc. 57: 296, fig. 17. ♂, ♀.
- hurdi** Parker. N. Mex., Ariz.; Mexico (Sonora, Baja California).  
*Microdynerus hurdi* Parker, 1970. Pan-Pacific Ent. 46: 248, figs. 4, 21, 27, 34. ♂, ♀.
- inusitatus** Parker. Calif.  
*Microdynerus inusitatus* Parker, 1970. Pan-Pacific Ent. 46: 248. ♂, ♀.
- lissosomus** (Bohart). Calif.  
*Odynerus lissosomus* Bohart, 1940. Pan-Pacific Ent. 16: 88. ♂, ♀.
- monolobus** (Bohart). Tex., Fla.  
*Odynerus heterospilus* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 201. ♀. Preocc. by Cameron, 1907.  
*Leptochilus monolobus* Bohart, 1951. U. S. Dept. Agr., Agr. Monog. 2: 897. N. name.
- patagoniae** Parker. Ariz. (Patagonia).  
*Microdynerus patagoniae* Parker, 1970. Pan-Pacific Ent. 46: 252, fig. 23. ♂.
- sayi** (Cameron). Calif., Nev., Oreg., Idaho.  
*Ancistrocerus sayi* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 221. ♂.  
*Leptochilus williamsi* Bohart, 1955. Ent. Soc. Wash., Proc. 57: 297, fig. 14. ♂, ♀.
- Taxonomy: Bohart, 1965. Pan-Pacific Ent. 41: 112 (synonymy).
- schlingeri** (Bohart). Calif.  
*Leptochilus schlingeri* Bohart, 1955. Ent. Soc. Wash., Proc. 57: 298, figs. 4, 5, 18. ♂, ♀.
- singulus** (Bohart). S. Dak. south to Tex., west to Idaho, Ariz., Calif. Ecology: Nests in *Sambucus* stems. Prey: Lepidoptera larvae.  
*Leptochilus singulus* Bohart, 1955. Ent. Soc. Wash., Proc. 57: 293, fig. 11. ♂, ♀.
- Biology: Parker, 1970. Pan-Pacific Ent. 46: 243 (nest, life history).
- trinodus** (Bohart). Calif., Ariz., N. Mex., Tex.  
*Leptochilus trinodus* Bohart, 1955. Ent. Soc. Wash., Proc. 57: 289, figs. 2, 6, 7, 9. ♂, ♀.
- umbifer** (Bohart). Calif.  
*Leptochilus umbifer* Bohart, 1955. Ent. Soc. Wash., Proc. 57: 297, fig. 16. ♂, ♀.

### Genus LEPTOCHILUS Saussure

#### Genus LEPTOCHILUS Subgenus LEPTOCHILUS Saussure

- Leptochilus* Saussure, 1853. Etudes sur la famille des Vespides, v. 1, p. 233.  
 Type-species: *Pterochilus* (!) *mauritanicus* Lepeletier. Desig. by Ashmead, 1902.
- Zendalia* Robertson, 1928. Flowers and Insects, p. 12.  
 Type-species: *Odynerus zendaloides* Robertson. Desig. by Bohart, 1951  
 (= *Leptochilus ornatus* Saussure).

Only the typical subgenus occurs in North America. The nests are constructed in pre-existing cavities, usually in stems or twigs, but a Mexican species is recorded as nesting in a rock crevice, and the type-species from Europe apparently nests only in empty snail shells. The species are known to prey upon larvae of Coleoptera or Lepidoptera, or sometimes a combination of both.

Revision: Parker, 1966. Ent. Soc. Amer., Misc. Pub. 5: 153-229, 239 figs., 18 maps (Nearctic spp.).

## SPECIES GROUP MESOLOBUS

**mesolobus** Parker. Southern Calif. in Mojave Desert.

*Leptochilus mesolobus* Parker, 1966. Ent. Soc. Amer., Misc. Pub. 5: 177, figs. 33, 38, 39, 42, 43, map 16. ♂, ♀.

## SPECIES GROUP MINUTISSIMUS

Taxonomy: Bohart, 1940. Pan-Pacific Ent. 16: 87 (group characters).

**gibberus** Parker. Southern Ariz. in mts.

*Leptochilus gibberus* Parker, 1966. Ent. Soc. Amer., Misc. Pub. 5: 180, figs. 34, 37, 40, 44, 45, map 1. ♂, ♀.

**minutissimus** (Bohart). Tex. to Calif., Nev.; Mexico (Baja California).

*Odynerus minutissimus* Bohart, 1940. Pan-Pacific Ent. 16: 87. ♂, ♀.

**petilus** Parker. Southwest Tex.; Mexico south to Oaxaca and Puebla. Ecology: Nest in old beetle burrow in dead twig. Prey: Leaf-mining larvae of Coleoptera.

*Leptochilus petilus* Parker, 1966. Ent. Soc. Amer., Misc. Pub. 5: 178, figs. 35, 36, 41, 46, 47, map 1. ♂, ♀.

Biology: Parker, 1966. Ent. Soc. Amer., Misc. Pub. 5: 166, fig. 4 (nest, prey).

## SPECIES GROUP ERUBESCENS

Both species nest in twigs and use macerated pith rather than mud in nest construction.

Taxonomy: Bohart, 1940. Pan-Pacific Ent. 16: 89 (group characters).

**erubescens** (Bohart). Wash. and Idaho south to Calif. and Nev. Ecology: Nests in *Sambucus* stems. Prey: Larvae of Coleoptera.

*Odynerus erubescens* Bohart, 1940. Pan-Pacific Ent. 16: 89. ♂, ♀.

Biology: Parker, 1966. Ent. Soc. Amer., Misc. Pub. 5: 162 (nest, life history).

**perialis** Parker. Oreg., Calif., Nev., Utah, Ariz. Ecology: Nests in living and dead stems and twigs. Parasite: *Anthrax irroratus* Say; *Aritranis notata sierrae* Tow.; *Microdontomerus anthidii* (Ashm.); *Ceratochrysis thysana* Boh. Prey: Larvae of Gelechioidea.

*Leptochilus perialis* Parker, 1966. Ent. Soc. Amer., Misc. Pub. 5: 182, figs. 50-54, 58, 59, map 2. ♂, ♀.

Biology: Parker, 1966. Ent. Soc. Amer., Misc. Pub. 5: 160-162, fig. 2 (nest, life history).

## SPECIES GROUP BELLULUS

**autumnus** Parker. Western Nev.

*Leptochilus autumnus* Parker, 1966. Ent. Soc. Amer., Misc. Pub. 5: 185. ♀.

**bellulus** (Cresson). Ga., Ala., Miss., Ark., Okla., Tex.; Mexico (Tamaulipas, Veracruz, Guanajuato).

*Odynerus bellulus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 243. ♀.

*Odynerus fedorensis* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 200. ♂.

**ellenae** Parker. Calif., Ariz. Ecology: Nests in old beetle borings in dead *Ephedra* branches.

*Leptochilus ellenae* Parker, 1966. Ent. Soc. Amer., Misc. Pub. 5: 185, figs. 60, 63-65, 71, 72, map 3. ♂, ♀.

Biology: Parker, 1966. Ent. Soc. Amer., Misc. Pub. 5: 162 (nest).

**marshi** Parker. N. Mex., Ariz.

*Leptochilus marshi* Parker, 1966. Ent. Soc. Amer., Misc. Pub. 5: 184, figs. 61, 69, 70, map 3. ♂, ♀.

## SPECIES GROUP RUFINODUS

The species of this group build the most complex nests in the family Eumenidae. The known species construct a linear series of cells in old borings in twigs. Each cell is closed with a complex plug consisting of a layer of macerated pith above which is a layer of mud or sand. At maturity the larva moves through the pith layer into the earthen layer and moves the earthen particles around, spinning them together with silk to form a cocoon.

Taxonomy: Bohart, 1940. Pan-Pacific Ent. 16: 81-82 (key to spp., group characters).

**chiricahua** Parker. Southern Ariz. and Calif. Ecology: Nests in *Sambucus* stem traps.

Parasite: *Macrosiagon c. cruentum* (Germ.); *Sphaerophthalma amphion* (Fox). Prey:

Larvae of leaf-mining Coleoptera.

*Leptochilus chiricahua* Parker, 1966. Ent. Soc. Amer., Misc. Pub. 5: 190, figs. 91, 97, 98, map 6. ♂, ♀.

Biology: Parker, 1966. Ent. Soc. Amer., Misc. Pub. 5: 166 (nest, prey, parasite).

**ornatus** Saussure. Mass. to Fla., Nebr., Colo., Kans., Tex. Ecology: Nests in old borings in twigs of *Rhus* and *Sambucus*. Parasite: *Toxophora amphitea* Wlkr.; *Rhydinofoenus tarsatorius* (Say); *Epistenia osmia* Ashm., *E. coeruleata* Westw.; *Ceratochrysis enhuycki* Coop. Prey: *Chalepus scapularis* Oliv.?, *C. dorsalis* Thunb.?, *Brachys ovatus* complex; *Prionomerus calceatus* (Say); all are leaf-mining beetle larvae.

*Leptochilus Ornatus* Saussure, 1853. Etudes sur la famille des Vespides, v. 1, p. 236. ♀, ♂. Preocc. in *Odynerus*.

*Odynerus republicanus* Dalla Torre, 1889. Wien. Ent. Ztg. 8: 125. N. name.

*Odynerus zendaloides* Robertson, 1901. Amer. Ent. Soc., Trans. 27: 197. ♂.

Biology: Rau, 1928. Acad. Sci. St. Louis, Trans. 25: 400-404 (nest, life history). — Krombein, 1959. Ent. News 70: 17-23 (nest, life history).

**rubicundulus** (Bohart). Calif.; Mexico (Baja California).

*Odynerus rubicundulus* Bohart, 1940. Pan-Pacific Ent. 16: 90. ♂, ♀.

**rufinodus** (Cresson). Wash. to Calif., east through Idaho to Wyo., western Kans. and N. Mex.

Ecology: Nests in stems of *Sambucus*, *Foeniculum*, *Cirsium*, *Tetradymia*, *Nama*.

Parasite: *Anthrax irratoratus* Say; *Clistopyga canadensis* Prov.; *Eurytoma stigni* Ashm.; *Epistenia odyneri* Ashm., *E. sp.*; *Ceratochrysis tuberella* Boh., *Chrysis derivata* Buyss., *C. parkeri* Moore?

*Odynerus rufinodus* Cresson, 1868. Amer. Ent. Soc., Trans. 1: 381. ♀.

*Odynerus rufobasilaris* Ashmead, 1896. Psyche 7: 335. ♀.

*Odynerus bruesi* Cameron, 1909. Pomona Col. Jour. Ent. 1: 81. ♂.

Biology: Davidson, 1896. Psyche 7: 335-336 (nest). — Parker, 1966. Ent. Soc. Amer., Misc. Pub. 5: 163-165, figs. 5, 6 (nest, life history).

**trachysomus** (Bohart). Utah, Ariz., N. Mex., Tex.; Mexico. Ecology: Nests in trap-stems.

*Odynerus trachysomus* Bohart, 1940. Pan-Pacific Ent. 16: 84. ♂, ♀.

**washo** Parker. Calif., Nev., Utah, Ariz., N. Mex., western Tex.; Mexico (Chihuahua). Ecology:

Nests in stems of *Argemone*, *Stanleya*, *Sambucus*. Parasite: *Macrosiagon c. cruentum*

(Germ.); *Phaenacra* sp.; *Anthrax irratoratus* Say; *Sphaerophthalma* (*Photopsis*) sp.;

*Chrysis pattoni* Aar. Prey: Leaf-mining larvae of *Exema* sp.

*Leptochilus washo* Parker, 1966. Ent. Soc. Amer., Misc. Pub. 5: 189, figs. 79, 80, 87, 88, 93, map 4. ♂, ♀.

Biology: Parker, 1966. Ent. Soc. Amer., Misc. Pub. 5: 165 (nest, life history).

## SPECIES GROUP ACOLHUUS

Taxonomy: Bohart, 1940. Pan-Pacific Ent. 16: 85 (characters of *tylocephalus* group).

**acoluus** (Saussure). N. J. to Fla., Ala., Tex. to Ariz.; Mexico to Costa Rica. Prey: Leaf-mining larvae of Gracilariidae from *Galactica*.

*Odynerus (Odynerus) acoluus* Saussure, 1857. Rev. Mag. Zool. (2) 9: 280. ♀.

*Odynerus tylocephalus* Bohart, 1940. Pan-Pacific Ent. 16: 85. ♂, ♀.

*Odynerus monotylos* Bohart, 1940. Pan-Pacific Ent. 16: 86. ♂, ♀.

Biology: Krombein, 1964. Amer. Mus. Novitates 2201: 10 (prey).

**californicus** Parker. Southern Calif. in mts.

*Leptochilus californicus* Parker, 1966. Ent. Soc. Amer., Misc. Pub. 5: 195, figs. 104, 110, 115, 129, 130, map 7. ♂, ♀.

## SPECIES GROUP PAIUTE

**paiute** Parker. Nev., Calif.

*Leptochilus paiute* Parker, 1966. Ent. Soc. Amer., Misc. Pub. 5: 199, figs. 132, 135, 136, 138, 139, 147, 148, map 9. ♂, ♀.

**stangei** Parker. N. Mex. (Jemez Springs); Mexico (Guanajuato). Ecology: Nests in hole in rock.

*Leptochilus stangei* Parker, 1966. Ent. Soc. Amer., Misc. Pub. 5: 199, figs. 133, 149, 151, map 9. ♂, ♀.

Biology: Parker, 1966. Ent. Soc. Amer., Misc. Pub. 5: 166 (nest).

## SPECIES GROUP IRWINI

**irwini** Parker. Southern Tex. to Calif., Nev. Ecology: Nests in old *Harmolita* galls on *Hilaria*.

*Leptochilus irwini* Parker, 1966. Ent. Soc. Amer., Misc. Pub. 5: 199, figs. 131, 137, 140, 144, 146, map 9. ♂, ♀.

Biology: Parker, 1966. Ent. Soc. Amer., Misc. Pub. 5: 166-167 (nest).

**krombeini** Parker. Fla. (Highlands Co.). Ecology: May nest in dead twigs of live oak.

*Leptochilus krombeini* Parker, 1966. Ent. Soc. Amer., Misc. Pub. 5: 201, figs. 134, 141, 143, map 9. ♂, ♀.

Biology: Parker, 1966. Ent. Soc. Amer., Misc. Pub. 5: 167 (nest).

## SPECIES GROUP ELECTUS

**crocatu** Parker. Ariz. (Huachuca Mts.); Mexico (Morelos, Guerrero, Puebla).

*Leptochilus crocatu* Parker, 1966. Ent. Soc. Amer., Misc. Pub. 5: 210, figs. 158, 159, map 12. ♂, ♀.

**electus** (Cresson). S. C., Fla., Kans., Colo., Tex., N. Mex., Ariz., Nev., Calif.; Mexico (Chihuahua, Sonora, Sinaloa, Zacatecas). Ecology: Nests in small branches of dead composite in desert. Parasite: *Microdontomerus anthidii* (Ashm.). Prey: Larvae of Lepidoptera.

*Odynerus electus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 243. ♂.

Biology: Parker, 1966. Ent. Soc. Amer., Misc. Pub. 5: 167, fig. 3 (nest, parasite).

**ferrugineus** Parker. Ariz. to Tex. in Chihuahuan Desert.

*Leptochilus ferrugineus* Parker, 1966. Ent. Soc. Amer., Misc. Pub. 5: 206, figs. 156, 157, 170, map 12. ♂, ♀.

**levinodus** Bohart. Calif. (Needles); Mexico (Baja California).

*Leptochilus levinodus* Bohart, 1948. Calif. Acad. Sci., Proc. (4) 24: 324. ♂, ♀.

**menkei** Parker. Nev., Ariz., Calif.; Mexico (Baja California). Ecology: Nests in beetle burrow in *Ephedra*, and in gall on *Tetradymia*.

*Leptochilus menkei* Parker, 1966. Ent. Soc. Amer., Misc. Pub. 5: 206, figs. 1, 152, 153, 164, 166, 167, 171, 175, map 12. ♂, ♀.

Biology: Parker, 1966. Ent. Soc. Amer., Misc. Pub. 5: 167 (nest).

**michelbacheri** Bohart. Calif.; Mexico (Baja California).

*Leptochilus michelbacheri* Bohart, 1948. Calif. Acad. Sci., Proc. (4) 24: 326. ♂, ♀.

**tosquineti** (Cameron). Calif., Nev. Ecology: Nests in twigs of *Sambucus* and in gall on *Tetradymia*. Prey: Yponomeutidae, larvae.

*Odynerus tosquineti* Cameron, 1909. Pomona Col. Jour. Ent. 1: 82. ♂.

Biology: Parker, 1966. Ent. Soc. Amer., Misc. Pub. 5: 167 (nest, prey).

## SPECIES GROUP CHICHIMECUS

**boharti** Parker. Calif.

*Leptochilus boharti* Parker, 1966. Ent. Soc. Amer., Misc. Pub. 5: 217, figs. 210, 211, 226, 229, 233, map 18. ♂, ♀.

- brachialis** Parker. Southern Tex.; Mexico (Chihuahua, Queretaro, Zacatecas, Durango).  
*Leptochilus brachialis* Parker, 1966. Ent. Soc. Amer., Misc. Pub. 5: 215, figs. 214, 215, 230, 235, map 17. ♂, ♀.
- chichimecus** (Saussure). Southern Ariz. and Tex. south to El Salvador.  
*Odynerus chichimecus* Saussure, 1855. Etudes sur la famille des Vespides, v. 3, p. 280. ♀.
- doliis** Parker. Ariz. in Sonoran Desert; Mexico (Sonora, Sinaloa).  
*Leptochilus doliis* Parker, 1966. Ent. Soc. Amer., Misc. Pub. 5: 216, figs. 194, 195, 227, map 17. ♂, ♀.
- humerus** Parker. Calif., Nev., Ariz., Tex.  
*Leptochilus humerus* Parker, 1966. Ent. Soc. Amer., Misc. Pub. 5: 220, figs. 202, 203, 220, map 10. ♂, ♀.
- labrosus** Parker. Southern Ariz. and Calif.  
*Leptochilus labrosus* Parker, 1966. Ent. Soc. Amer., Misc. Pub. 5: 218, figs. 196, 197, 218, 232, map 18. ♂, ♀.
- milleri** Parker. Southern Calif. in Colorado Desert.  
*Leptochilus milleri* Parker, 1966. Ent. Soc. Amer., Misc. Pub. 5: 222, figs. 200, 201, 228, 231, map 10. ♂, ♀.
- monticolus** Parker. Nev., Ariz., N. Mex.  
*Leptochilus monticolus* Parker, 1966. Ent. Soc. Amer., Misc. Pub. 5: 220, figs. 204, 205, 221, map 10. ♂, ♀.
- propodealis** Bohart. Calif.; Mexico (Baja California).  
*Leptochilus propodealis* Bohart, 1948. Calif. Acad. Sci., Proc. (4) 24: 325, figs. 4-6. ♂, ♀.

#### Genus CEPHALODYNERUS Parker

- Cephalodynerus* Parker, 1965. Ent. Soc. Amer., Ann. 58: 364.  
 Type-species: *Cephalodynerus unicornis* Parker. Orig. design.
- Taxonomy: Parker, 1965. Ent. Soc. Amer., Ann. 58: 365 (key to spp.).
- deformiceps** (Bohart). Southern Ariz.  
*Odynerus deformiceps* Bohart, 1942. Pan-Pacific Ent. 18: 153, figs. 1, 8, 11, 12. ♂, ♀.
- russipes** (Bohart). Calif., Nev. in U. Sonor. Zone.  
*Odynerus russipes* Bohart, 1942. Pan-Pacific Ent. 18: 152, figs. 13, 15. ♂, ♀.
- sculleni** Parker. Tex. (Big Bend Natl. Park).  
*Cephalodynerus sculleni* Parker, 1965. Ent. Soc. Amer., Ann. 58: 365, figs. 4, 9, 14. ♂.
- unicornis** Parker. Ariz., Utah.  
*Cephalodynerus unicornis* Parker, 1965. Ent. Soc. Amer., Ann. 58: 365, figs. 1, 6, 15, 16, 19. ♂, ♀.
- vanduzeei** (Bohart), n. comb. (R. M. Bohart and J. van der Vecht). Western Tex., N. Mex., Ariz.; Mexico (Baja California). Ecology: Nests in borings in wood. Prey: Caterpillars.  
*Stenodynerus vanduzeei* Bohart, 1948. Calif. Acad. Sci., Proc. (4) 24: 327. ♂, ♀.
- Biology: Krombein, 1967. Trap-nesting wasps and bees, p. 140 (nest, prey, life history).

#### Genus SMERINGODYNERUS Snelling

- Smeringodynerus* Snelling, 1975. Ent. Soc. Wash., Proc. 77: 56.  
 Type-species: *Odynerus morelios* Saussure. Orig. design.
- Taxonomy: Snelling, 1975. Ent. Soc. Wash., Proc. 77: 56-58, 7 figs.
- morelios** (Saussure). Ariz., N. Mex., western Tex.; Mexico (temperate parts).  
*Odynerus (Odynerus) Morelios* Saussure, 1857. Rev. Mag. Zool. (2) 9: 276.  
*Odynerus Moreliae* (!) Saussure, 1875. Smithsn. Inst., Misc. Collect. 254: 186.  
*Odynerus Morelii* Saussure, 1875. Smithsn. Inst., Misc. Collect. 254: 299. ♂. Emend. of *morelios*.  
*Odynerus Morelos* (!) Saussure, 1875. Smithsn. Inst., Misc. Collect. 254: 299.  
*Ancistrocerus* (?) *nigro-hirsutus* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 203. ♀.  
*Odynerus (Stenodynerus) canamexicus* Rohwer, 1912. U. S. Natl. Mus., Proc. 41: 448. ♂.

## Genus DOLICHODYNERUS Bohart

*Odynerus* subg. *Dolichodynerus* Bohart, 1939. Pan-Pacific Ent. 15: 101.

Type-species: *Odynerus (Dolichodynerus) turgiceps* Bohart. Orig. desig.

**tanynotus** (Cameron). Calif., Ariz., N. Mex., Tex.; Mexico (Nuevo Leon).

*Odynerus* (?) *tanynotus* Cameron, 1909. Pomona Col. Jour. Ent. 1: 133. ♀.

**turgiceps** (Bohart). Calif., Ariz., N. Mex.

*Odynerus (Dolichodynerus) turgiceps* Bohart, 1939. Pan-Pacific Ent. 15: 102, figs. 4-8. ♂, ♀.

**vandykei** Bohart. Ariz.

*Dolichodynerus vandykei* Bohart, 1950. Biol. Soc. Wash., Proc. 63: 80. ♂, ♀.

## Genus MARICOPODYNERUS Viereck

*Odynerus* subg. *Maricopodynerus* Viereck, 1908. Amer. Ent. Soc., Trans. 33: 397.

Type-species: *Odynerus (Maricopodynerus) maricoporum* Viereck. Monotypic.

One species has been reared from stems of *Sambucus*. It is presumed that all species nest in abandoned burrows or cavities in stems or twigs. The prey is unknown.

Revision: Bohart, 1950. Brooklyn Ent. Soc., Bul. 45: 17-25.

**chisosensis** Bohart. Western Tex.

*Maricopodynerus chisosensis* Bohart, 1950. Brooklyn Ent. Soc., Bul. 45: 20. ♂, ♀.

**decorabilis** Bohart. Oreg., Nev., Calif.

*Maricopodynerus decorabilis* Bohart, 1950. Brooklyn Ent. Soc., Bul. 45: 22. ♂, ♀.

**lissus** Bohart. Ariz., southeastern Calif.

*Maricopodynerus lissus* Bohart, 1950. Brooklyn Ent. Soc., Bul. 45: 23. ♂, ♀.

**maricoporum** (Viereck). Calif., Nev., Ariz., N. Mex., Tex.; Mexico (Baja California).

*Odynerus (Maricopodynerus) maricoporum* Viereck, 1908. Amer. Ent. Soc., Trans. 33: 397. ♂.

*Odynerus chelonogastrus* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 202. ♀.

**rudiceps** Bohart. Nev., Calif., Idaho, Colo., Mont., Oreg., Wash., Utah, Ariz.

*Maricopodynerus rudiceps* Bohart, 1950. Brooklyn Ent. Soc., Bul. 45: 21. ♂, ♀.

**sericifrons** Bohart. Southern Calif., Ariz. Ecology: Nests in *Sambucus* stems.

*Maricopodynerus sericifrons* Bohart, 1950. Brooklyn Ent. Soc., Bul. 45: 19. ♂, ♀.

Biology: Parker and Bohart, 1968. Pan-Pacific Ent. 44: 2 (nest).

**shannoni** Bohart. Wash.

*Maricopodynerus shannoni* Bohart, 1950. Brooklyn Ent. Soc., Bul. 45: 24. ♂.

## Genus STENODYNERUS Saussure

*Stenodynerus* Saussure, 1863. Soc. Phys. Hist. Nat. Geneve, Mem. 16: 228. Proposed originally as a division of *Odynerus* subg. *Leionotus* Sauss.; validated by Op. 893, Internatl. Comn. Zool. Nomencl., 1970.

Type-species: *Odynerus chinensis* Saussure. Desig. by Bohart, 1939.

*Nannodynerus* Bluethgen, 1938. Konowia 16: 281.

Type-species: *Lionotus teutonicus* Bluethgen. Orig. desig.

Most species utilize as nesting sites abandoned borings of other insects in twigs, stems or wood, or old mud-dauber nests. A few make burrows in soil for a nesting site; in at least one species a mud turret is constructed over the burrow entrance. Most species prey upon caterpillars, but two of the ground-nesting species use larvae of both Lepidoptera and Coleoptera.

Revision: Bohart, 1943. Brooklyn Ent. Soc., Bul. 38: 6-11 (Anormis group). — Bohart, 1944.

Pan-Pacific Ent. 20: 69-75 (Fundatus group). — Bohart, 1948. Fla. Ent. 31: 71-77 (Fla. spp.).

— Bohart, 1949. Ent. Soc. Wash., Proc. 51: 237-253 (Ariz. spp.).

Taxonomy: van der Vecht, 1966. Ent. Ber. 26: 163 (generic synonymy). — van der Vecht,

1967. Bul. Zool. Nomencl. 24: 31 (request for validation of *Stenodynerus* Sauss.).

— Internatl. Comn. Zool. Nomencl., 1970. Bul. Zool. Nomencl. 26: 187 (validation of *Stenodynerus* Sauss., type-species *Odynerus chinensis* Sauss.).

**ammonia ammonia** (Saussure). Fla., S. C.

*Odynerus* (*Ancistrocerus*) *ammonia* Saussure, 1852. Etudes sur la famille des Vespides, v. 1, p. 122. ♀.

*Odynerus ammonis* Smith, 1857. Cat. Hym. Brit. Mus., v. 5, p. 83. Emend.

*Odynerus floridanus* Robertson, 1901. Amer. Ent. Soc., Trans. 27: 197. ♀.

**ammonia paraensis** (Saussure). U. S. west to Tex., Kans., Minn.

*Odynerus* (*Ancistrocerus*) *paraensis* Saussure, 1855. Etudes sur la famille des Vespides, v. 3, p. 207. ♂.

*Odynerus clypeatus* Robertson, 1901. Amer. Ent. Soc., Trans. 27: 196. ♂, ♀. Preocc. N. syn. (J. van der Vecht).

*Odynerus clypeolatus* Dalla Torre, 1904. In Wytsman, Gen. Ins., fasc. 19, p. 42. N. name. N. syn. (J. van der Vecht).

*Odynerus bradleyi* Robertson, 1925. Amer. Ent. Soc., Trans. 51: 82. N. name. Preocc. N. syn. (J. van der Vecht).

**anatropus** Bohart. Calif., southern Oreg., Nev. Ecology: Observed nesting in loose gravelly dirt on a 45 degree slope, the cells made of dirt stuck to a silk lining.

*Stenodynerus anatropus* Bohart, 1944. Pan-Pacific Ent. 20: 71. ♂, ♀.

**anormiformis** (Viereck). Southeastern Calif., Ariz.

*Odynerus* (*Stenodynerus*) *anormiformis* Viereck, 1908. Amer. Ent. Soc., Trans. 33: 407. ♀.

**anormis** (Say). Transcontinental and widespread in U. S. and Canada. Ecology: Reared from cells in a pithy stem, the cells separated by mud partitions. Parasite: *Amobia* sp. Prey: Caterpillars.

*Eumenes anormis* Say, 1824. In Keating, Narr. Long's 2nd Exped., v. 2, p. 346. ♂.

*Odynerus oculatus* Say, 1837. Boston Jour. Nat. Hist. 1: 385. ♂.

*Odynerus* (*Odynerus*) *Persecutor* Saussure, 1855. Etudes sur la famille des Vespides, v. 3, p. 256. ♂.

*Odynerus* (*Ancistrocerus*) *philetas* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 214. ♀.

*Ancistrocerus truncatus* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 217. ♀. Preocc.

*Odynerus approximatus* Cameron, 1909. Pomona Col. Jour. Ent. 1: 79. ♀.

*Odynerus crassispinus* Cameron, 1909. Pomona Col. Jour. Ent. 1: 130. ♂.

Biology: Peckham and Peckham, 1905. Wasps, Social and Solitary, p. 91 (nest, life history, prey). — Rau and Rau, 1918. Wasp Studies Afield, pp. 331-332 (nest, parasite).

**apache** Bohart. Ariz., N. Mex., Tex., Colo., Wyo., Utah, Nev., Calif., Oreg.; Mexico.

*Stenodynerus* (*Stenodynerus*) *apache* Bohart, 1949. Ent. Soc. Wash., Proc. 51: 244, fig. 1. ♂, ♀.

**australis** (Robertson). Fla.

*Odynerus australis* Robertson, 1901. Amer. Ent. Soc., Trans. 27: 197. ♂, ♀.

**beameri** Bohart. Fla. Ecology: Nests in borings in wood. Parasite: *Toxophora amphitea* Wlkr., *Anthrax a. argyropygus* Wied. Prey: Lepidoptera larvae.

*Stenodynerus* (*Stenodynerus*) *beameri* Bohart, 1948. Fla. Ent. 31: 75.

Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 126-128 (nest, prey, life history, parasites).

**blandoides blandoides** Bohart. Western U. S. except Ariz., east to N. Dak., Wyo., Colo., N. Mex. Ecology: Nests in *Sambucus* stems.

*Stenodynerus blandoides blandoides* Bohart, 1943. Brooklyn Ent. Soc., Bul. 38: 9. ♂, ♀.

Biology: Parker and Bohart, 1968. Pan-Pacific Ent. 44: 3 (nest).

**blandoides owensi** Bohart. Calif., Nev.

*Stenodynerus blandoides owensi* Bohart, 1943. Brooklyn Ent. Soc., Bul. 38: 10. ♂.

**blandus blandus** (Saussure). B. C., Wash., Idaho, Oreg., Calif., Ariz., Utah; Mexico (Baja California). Ecology: Nests in *Sambucus* stems.

*Odynerus* (*Odynerus*) *blandus* Saussure, 1870. Rev. Mag. Zool. (2) 22: 105. ♀.

*Odynerus mathewi* Cameron, 1906. Entomologist 39: 268. ♂.

*Odynerus giffardi* Rohwer, 1917. U. S. Natl. Mus., Proc. 53: 237. ♀.

Biology: Parker and Bohart, 1966. Pan-Pacific Ent. 42: 93 (nest).

**blandus catalinae** Bohart. Calif.

*Stenodynerus blandus catalinae* Bohart., 1943. Brooklyn Ent. Soc., Bul. 38: 10. ♂, ♀.

**blepharus** Bohart. Md. south to Fla., west to W. Va., Tex., Kans.

*Stenodynerus (Stenodynerus) blepharus* Bohart, 1953. Biol. Soc. Wash., Proc. 66: 185. ♂, ♀.

**canus canus** Bohart. B. C., Wash., Idaho, Mont., Wyo., Colo., Utah, Nev. Ecology: Nests in crevices in volcanic outcroppings with entrance capped by mud turret. Prey: Gelechiidae, Gracilariidae.

*Stenodynerus canus canus* Bohart, 1966. Biol. Soc. Wash., Proc. 79: 73, figs. 1-4. ♂, ♀.

Taxonomy: Clement, 1973 (1972). Pan-Pacific Ent. 48: 274-275, figs. 2-5 (larva).

Biology: Clement, 1973 (1972). Pan-Pacific Ent. 48: 271-274, fig. 1 (nest, prey, life history).

**canus helvolus** Bohart. Oreg., Calif., Nev., Ariz.

*Stenodynerus canus helvolus* Bohart, 1966. Biol. Soc. Wash., Proc. 79: 76. ♂, ♀.

**chisosensis** Bohart. Tex.

*Stenodynerus chisosensis* Bohart, 1966. Biol. Soc. Wash., Proc. 79: 79. ♂, ♀.

**claremontensis** (Cameron). Calif., Nev., Oreg., Idaho. Ecology: Nests in ground and constructs mud turret over entrance. Parasite: *Senotainia trilineata* (Wulp), *Amobia floridensis* (Tns.); *Toxophora virgata* O. S.; *Tetrastichus* sp.; *Chrysis venustella* Boh. Prey: *Smicronyx* sp.; Hispinae, probably *Xenochalepus* sp.; *Plutella maculipennis* (Curt.); Carposinidae sp.; *Gnorimoschema* sp.; Yponomeutidae sp.

*Odynerus (Stenodynerus) claremontensis* Cameron, 1905. Invertebrata Pacifica 1: 122. ♀.

*Odynerus mediatu* Cameron, 1909. Pomona Col. Jour. Ent. 1: 79. ♀.

Biology: Markin, 1965. Pan-Pacific Ent. 41: 139 (nest, behavior). —Markin and Gittins, 1967.

Univ. Idaho, Res. Bul. 74: 1-24, 13 figs. (nest, prey, life history, parasites).

**cochisensis** (Viereck). B. C., Wash., Idaho and Nebr., south to Calif., Ariz. and N. Mex.

Ecology: Nests in twigs and *Sambucus* stems.

*Odynerus (Stenodynerus) cochisensis* Viereck, 1908. Amer. Ent. Soc., Trans. 33: 395. ♂, ♀.

*Ancistrocerus pelias* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 208. ♀.

*Ancistrocerus pilias* (!) Cameron, 1909. Pomona Col. Jour. Ent. 1: 78.

Biology: Parker and Bohart, 1966. Pan-Pacific Ent. 42: 93 (nest).

**coniodes** Bohart. Calif., Nev., Utah, Idaho, N. Mex., Tex. Ecology: Nests in *Tetradymia* stems.

*Stenodynerus coniodes* Bohart, 1966. Biol. Soc. Wash., Proc. 79: 75.

*Stenodynerus conoides* (!) Bohart, 1966. Biol. Soc. Wash., Proc. 79: 79, figs. 17-20. ♂, ♀.

Biology: Parker and Bohart, 1966. Pan-Pacific Ent. 42: 94 (nest).

**foxensis** Bohart. Ariz., N. Mex.

*Stenodynerus foxensis* Bohart, 1944. Pan-Pacific Ent. 20: 73. ♂, ♀.

**fundatiformis fundatiformis** (Robertson). S. C., Ga., Fla., Ala., Miss., Tex., Ark., Mo. Ecology:

Nests in sandy soil but does not construct a turret above entrance. Parasite:

Bombyliidae sp.; Miltogrammini spp.? Prey: *Chlamisus* sp., Chlamisinae sp.; Pyralididae spp.; Gelechiidae sp.; Olethreutidae sp.; *Synchlora aerata* (F.); Psychidae sp.

*Odynerus fundatiformis* Robertson, 1901. Amer. Ent. Soc., Trans. 27: 197. ♂.

Biology: Evans, 1956. Ent. Soc. Wash., Proc. 58: 268, figs. 3, 4 (nest, prey). —Krombein, 1964.

Amer. Mus. Novitates 2201: 4-10 (nest, prey, life history, parasites).

**fundatiformis gonosecles** Bohart. U. S. west to Mississippi Valley, mostly in central and northern states.

*Stenodynerus fundatiformis gonosecles* Bohart, 1944. Pan-Pacific Ent. 20: 74. ♂, ♀.

**histrionalis histrionalis** (Robertson). U. S. west to Tex., Okla., Kans. Ecology: Nests in borings in wood. Parasite: *Pseudoxenos robertsoni* Pierce; *Amobia erythrura* (Wulp);

*Chrysis stenodyneri* Krom. Prey: Olethreutidae sp.; Gelechiidae sp.; Tortricidae sp.

*Odynerus histrionalis* Robertson, 1901. Amer. Ent. Soc., Trans. 27: 196. ♂, ♀.

Biology: Krombein, 1955. Ent. Soc. Wash., Proc. 57: 147-148 (nest, prey, life history).

—Krombein, 1967. Trap-nesting wasps and bees, pp. 134-136 (nest, prey, life history, parasites).



**histrionalis paenevagus** (Viereck). Tex., Kans., Colo.*Odynerus paenevagus* Viereck, 1906. Amer. Ent. Soc., Trans. 34: 224. ♀.*Nortonia* (?) *basimacula* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 224. ♀.**histrionalis rufustus** Bohart. Fla. Ecology: Nests in borings in wood. Parasite: *Amobia erythrura* (Wulp); *Chrysis stenodyneri* Krom. Prey: Olethreutidae sp.; Gelechiidae sp.; Tortricidae sp.*Stenodynerus histrionalis rufustus* Bohart, 1974. Kans. Ent. Soc., Jour. 47: 468. ♂, ♀.Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 134-136 (nest, prey, parasite, cocoon, life cycle; misdet. as *ammonia histrionalis* (Robt.)).**hoferi** Bohart. Southern Ariz.*Stenodynerus* (*Stenodynerus*) *hoferi* Bohart, 1949. Ent. Soc. Wash., Proc. 51: 246, fig. 3. ♂, ♀.**hybogaster** Bohart. Mo., Kans. and Colo. south to Miss. and N. Mex.*Stenodynerus hybogaster* Bohart, 1966. Biol. Soc. Wash., Proc. 79: 76, figs. 5-8. ♂, ♀.**innobilis** Bohart. Southern Calif.*Stenodynerus innobilis* Bohart, 1966. Biol. Soc. Wash., Proc. 79: 77, figs. 15, 16. ♂, ♀.**kennicottianus antheus** (Cameron). West. U. S. east to Wyo., Utah, N. Mex.*Ancistrocerus antheus* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 210. ♂.*Ancistrocerus tityrus* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 211. ♀.*Ancistrocerus satyrus* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 211. ♂.**kennicottianus kennicottianus** (Saussure). Transcont. in U. S. and Canada except southwest.*Odynerus* (*Odynerus*) *Kennicottianus* Saussure, 1870. Rev. Mag. Zool. (2) 22: 104.**krombeini** Bohart. N. C. (Kill Devil Hills). Ecology: Nests in wood borings in sandy areas.Parasite: *Pyemotes ventricosus* (Newp.); Miltogrammini sp.; *Chrysis stenodyneri* Krom. Prey: Gelechiidae sp.; Olethreutidae sp.*Stenodynerus* (*Stenodynerus*) *krombeini* Bohart, 1953. Biol. Soc. Wash., Proc. 66: 187. ♂, ♀.

Biology: Krombein, 1955. Ent. Soc. Wash., Proc. 57: 148 (nest, life history, parasite).

—Krombein, 1967. Trap-nesting wasps and bees, pp. 128-130 (nest, prey, life history, parasites).

**lindemanni** (Cameron). Tex. (Lee Co.).*Ancistrocerus lindemanni* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 219. ♂.**lineatifrons** Bohart. Fla., S. C., N. C. Ecology: Nests in borings in wood in sandy areas.Parasite: *Toxophora amphitea* Wlkr.; *Chrysis stenodyneri* Krom. Prey: Olethreutidae sp.; *Rhyacionia frustrana* (Comst.), Tortricidae sp.; Gelechiidae sp.; Olethreutidae sp. *Stenodynerus* (*Stenodynerus*) *lineatifrons* Bohart, 1948. Fla. Ent. 31: 76. ♂, ♀.

Biology: Krombein, 1953. Ent. Soc. Wash., Proc. 55: 115 (prey). —Krombein, 1967.

Trap-nesting wasps and bees, pp. 136-140 (nest, prey, life history, parasites).

**lissolobus** Bohart. Ariz., N. Mex.; Mexico*Stenodynerus* (*Stenodynerus*) *lissolobus* Bohart, 1949. Ent. Soc. Wash., Proc. 51: 246, fig. 8. ♂, ♀.**lixovestis** Bohart. Calif. (southern), Ariz., N. Mex., western Tex.*Stenodynerus* (*Stenodynerus*) *lixovestis* Bohart, 1949. Ent. Soc. Wash., Proc. 51: 247, fig. 4. ♂, ♀.**lucidus** (Rohwer). Que., Ont., B. C., Calif., Oreg., Wash., Idaho, Utah, Colo., Wyo., Mont., Minn.*Ancistrocerus lucidus* Rohwer, 1917. U. S. Natl. Mus., Proc. 53: 235. ♂.**microstictus** (Viereck). U. S. east to Missouri River, north to S. Dak., Wyo., Calif.; Mexico.

Ecology: Nests in ground and constructs an entrance turret to burrow. Prey:

Phaloniidae sp.; Gelechiidae sp.; Cosmopterigidae sp.

*Odynerus microstictus* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 199. ♀.*Odynerus* (*Stenodynerus*) *gueliemi* Viereck, 1908. Amer. Ent. Soc., Trans. 33: 408. ♀.*Ancistrocerus* (*Nortonia*) *phoenixensis* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 225. ♂, ♀.

Biology: Evans, 1956. Ent. Soc. Wash., Proc. 58: 269, figs. 7, 8 (nest, prey, life history)

**noticeps clarki** Bohart. Calif.

*Stenodynerus noticeps clarki* Bohart, 1948. Calif. Acad. Sci., Proc. (4) 24: 331. ♂, ♀.

**noticeps noticeps** Bohart. Calif., Nev., Oreg., Wash., Utah, Idaho, Wyo., Colo.

*Stenodynerus noticeps noticeps* Bohart, 1948. Calif. Acad. Sci., Proc. (4) 24: 330. ♂, ♀.

**ochrogonius** Bohart. Ariz., N. Mex.

*Stenodynerus ochrogonius* Bohart, 1944. Pan-Pacific Ent. 20: 74. ♂, ♀.

Biology: Linsley, 1962. Ent. Soc. Amer., Ann. 55: 155-156, fig. 3 (sleeping habits).

**oculeus illinoensis** (Robertson). Ill., Minn., Mich., N. Y., D. C., Va., northern Fla., La., Tex.

*Odynerus illinoensis* Robertson, 1901. Amer. Ent. Soc., Trans. 27: 197. ♂, ♀.

**oculeus oculeus** (Robertson). Fla., Ga.

*Odynerus oculeus* Robertson, 1901. Amer. Ent. Soc., Trans. 27: 197. ♂, ♀.

**opalinus** Bohart. Calif., Ariz., N. Mex.

*Stenodynerus opalinus* Bohart, 1966. Biol. Soc. Wash., Proc. 79: 80, figs. 10, 11. ♂, ♀.

**painteri** Bohart. Southern Ariz.

*Stenodynerus (Stenodynerus) painteri* Bohart, 1949. Ent. Soc. Wash., Proc. 51: 248. ♂.

**papagorum papagorum** (Viereck). Sask., Idaho, Wyo., Colo., Kans., N. Mex., Utah, Ariz.;

Mexico. Ecology: Nests gregariously in soil, the burrow entrance capped by a mud turret, stores 14-19 coleopterous leafminers per cell. Prey: Noctuidae sp.; Anthonomini sp.; *Xenochalepus* sp. Predator: *Phylanthus pulcher* D. T.

*Odynerus (Stenodynerus) papagorum* Viereck, 1908. Amer. Ent. Soc., Trans. 33: 394. ♂, ♀.

Biology: Isely, 1914. Kans. Univ. Sci. Bul. (2) 8: 256-271 (nest, prey, life history). — Evans, 1970. Mus. Compar. Zool., Bul. 140: 479 (nest, prey, parasites?).

**papagorum tinctifer** Bohart. Wyo., Utah, Calif.

*Stenodynerus papagorum tinctifer* Bohart, 1944. Pan-Pacific Ent. 20: 71. ♂, ♀.

**patagoniensis** Bohart. Southern Ariz.

*Stenodynerus (Stenodynerus) patagoniensis* Bohart, 1949. Ent. Soc. Wash., Proc. 51: 249, fig. 7. ♂.

**percampanulatus** (Viereck). Western Tex., Okla., Kans., N. Mex., Ariz., Utah, Wyo., Idaho, eastern Wash.; Mexico.

*Odynerus percampanulatus* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 200. ♂.

*Odynerus (Stenodynerus) blavus* Rohwer, 1915. U. S. Natl. Mus., Proc. 49: 240. ♀.

*Odynerus (Stenodynerus) odontoschius* Rohwer, 1915. U. S. Natl. Mus., Proc. 49: 241. ♀.

*Odynerus (Stenodynerus) odontoschius* var. *dichrous* Rohwer, 1915. U. S. Natl. Mus., Proc. 49: 241. ♀.

**propinquus** (Saussure). Ala., Miss., La., Tex., Ark., Kans., Mo., Okla., N. Mex. Parasite:

*Pseudozenos fundati* Pierce.

*Odynerus (Odynerus) propinquus* Saussure, 1870. Rev. Mag. Zool. (2) 22: 104. ♀.

*Odynerus fundatus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 242. ♀, ♂.

**pulvinatus pulvinatus** Bohart. Mass. south to Fla., Mo., Kans., Mich.

*Stenodynerus* (!) *(Stenodynerus) pulvinatus* Bohart, 1953. Biol. Soc. Wash., Proc. 66: 186. ♂, ♀.

**pulvinatus surrufus** Krombein. Fla. Ecology: Nests in borings in wood. Parasite: *Anthrax a. argyropygus* Wied.; *Miltogrammini* sp.; *Chrysis inaequidens* Dahlb. Prey: Gelechiidae sp.; Olethreutidae sp.; *Salebriaria* sp., Phycitinae sp.

*Stenodynerus (Stenodynerus) pulvinatus surrufus* Krombein, 1959. Ent. Soc. Wash., Proc. 61: 149. ♂, ♀.

Biology: Krombein, 1959. Ent. Soc. Wash., Proc. 61: 150 (nest, prey, life history, parasite).

— Krombein, 1967. Trap-nesting wasps and bees, pp. 130-133 (nest, prey, life history, parasites).

**pulvivestis** Bohart. Ariz., Calif. in desert; Mexico.

*Stenodynerus (Stenodynerus) pulvivestis* Bohart, 1949. Ent. Soc. Wash., Proc. 51: 249, fig. 6. ♂, ♀.

**rudus** Bohart. Ariz., southern Calif., eastern Wash., Wyo.

*Stenodynerus (Stenodynerus) rudus* Bohart, 1949. Ent. Soc. Wash., Proc. 51: 250. ♂, ♀.

**sonoitensis** Bohart. Southern Ariz.

*Stenodynerus (Stenodynerus) sonoitensis* Bohart, 1949. Ent. Soc. Wash., Proc. 51: 251, fig. 9. ♂, ♀.

**superpendentis** Bohart. Ariz., Idaho, western Tex., Nev.

*Stenodynerus (Stenodynerus) superpendentis* Bohart, 1949. Ent. Soc. Wash., Proc. 51: 252, fig. 2. ♂, ♀.

**toas** (Cresson). Kans., Nebr., S. Dak., Wyo., Colo., Tex., N. Mex., Ariz., Calif. (San Diego Co.); Mexico. Parasite: *Pseudoxenos neomexicanus* Pierce. Predator: *Philanthus zebratus nitens* (Bks.).

*Odynerus toas* Cresson, 1868. Amer. Ent. Soc., Trans. 1: 381. ♂, ♀.

*Odynerus toas* (!) Cresson, 1872. Amer. Ent. Soc., Trans. 4: 243. Emend.

*Odynerus (Pachodynerus (!)) cressoni* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 198. ♂, ♀.

*Odynerus vegasensis* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 210. ♂.

*Odynerus pallidipictus* Cameron, 1909. Pomona Col. Jour. Ent. 1: 83. ♀.

Biology: Linsley, 1962. Ent. Soc. Amer., Ann. 55: 156 (sleeping habits).

**valliceps** Bohart. U. S. east to Minn., Kans., western Tex.; Mexico (Sinaloa).

*Stenodynerus valliceps* Bohart, 1948. Calif. Acad. Sci., Proc. (4) 24: 329. ♂, ♀.

**ventones** (Cameron). Tex. (Fedor).

*Odynerus ventones* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 210. ♂.

**williamsi** Bohart. Ariz., N. Mex.

*Stenodynerus (Stenodynerus) williamsi* Bohart, 1949. Ent. Soc. Wash., Proc. 51: 253, fig. 5. ♂, ♀.

**xanthianus** (Saussure). Southern Calif.; Mexico (Baja California).

*Odynerus (Odynerus) Xanthianus* Saussure, 1870. Rev. Mag. Zool. (2) 22: 103. ♀.

*Odynerus Xanthianus* (!) Saussure, 1875. Smithsn. Inst., Misc. Collect. 254: 204.

#### Genus PARANCISTROCERUS Bequaert

*Ancistrocerus* subg. *Parancistrocerus* Bequaert, 1925. Amer. Ent. Soc., Trans. 51: 64.

Type-species: *Odynerus (Ancistrocerus) fulvipes* Saussure. Orig. desig.

Most species make their nests in abandoned borings of other insects in twigs, stems or wood, in artificial borings in wood, in abandoned mud-dauber nests and insect galls, and in abandoned borings of ground-nesting wasps or bees in the ground. One species constructs multicellular mud nests attached to branches or twigs. The species have been reported as preying only upon larvae of Lepidoptera.

All species have a complex symbiotic relationship with saproglyphid mites, each wasp having a host-specific mite. Each species of wasp has developed an acarinarium, a chamber at the base of the second abdominal tergum which is covered by the apex of the first tergum. The hypopial stage of the mite congregates in large numbers in the acarinarium.

Revision: Bohart, 1948. Fla. Ent. 31: 71-74, 77-80 (Fla. spp.). — Bohart, 1949. Ent. Soc. Wash., Proc. 51: 237-241, 253-259 (Ariz. spp.). — Bohart, 1952. Ent. Soc. Wash., Proc. 54: 38-53 (Calif. spp., key to U. S. spp.).

**acarigaster** (Bohart). Wash., Oreg., Idaho, Utah, Calif., Nev., Ariz. Ecology: Nests in *Sambucus* stems and in abandoned mud-dauber nests. Parasite: *Chrysis parkeri* Moore. *Stenodynerus (Parancistrocerus) acarigaster* Bohart, 1952. Ent. Soc. Wash. Proc. 54: 49, fig. 8. ♂, ♀.

Biology: Parker and Bohart, 1966. Pan-Pacific Ent. 42: 93 (nests, parasite).

**acarophorus** (Bohart). Wash., Oreg., Calif., Nev. Ecology: Nests in *Sambucus* stems. Parasite: *Chrysis coeruleans* F.

*Stenodynerus (Parancistrocerus) acarophorus* Bohart, 1952. Ent. Soc. Wash., Proc. 54: 45, fig. 2. ♂, ♀.

Biology: Parker and Bohart, 1966. Pan-Pacific Ent. 42: 93 (nest, parasite).

**austrianus** (Cresson), n. comb. Tex., Okla., Kans., N. Mex.; Mexico.

*Odynerus austrianus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 243. ♂, ♀.

*Odynerus excentralis* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 198. ♀.

**bicornis bicornis** (Robertson), n. comb. Fla.

*Odynerus bicornis* Robertson, 1901. Amer. Ent. Soc., Trans. 27: 196. ♂, ♀.

**bicornis ceanothi** (Rohwer), n. comb. N. Y., Pa., Va., S. C., Mich., Tenn., Ark.

*Ancistrocerus* (*Stenancistrocerus*) *ceanothi* Rohwer, 1912. U. S. Natl. Mus., Proc. 51: 449. ♂, ♀.

**bicornis cushmani** (Bohart), n. comb. Western Tex., N. Mex., southern Ariz. Ecology: Nests in borings in wood. Parasite: Saproglyphidae sp.; Chrysididae sp.

*Stenodynerus* (*Parancistrocerus*) *bicornis cushmani* Bohart, 1949. Ent. Soc. Wash., Proc. 51: 253. ♂, ♀.

Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 143-144 (nest, life history, parasites).

**coronado** (Bohart), n. comb. Ariz., N. Mex., Utah, Colo., western Tex.

*Stenodynerus* (*Parancistrocerus*) *coronado* Bohart, 1949. Ent. Soc. Wash., Proc. 51: 255. ♂, ♀.

**cotti** (Bohart), n. comb. Calif., Oreg.

*Stenodynerus* (*Parancistrocerus*) *cotti* Bohart, 1952. Ent. Soc. Wash., Proc. 54: 52, fig. 11. ♂, ♀.

**declivatus** (Bohart), n. comb. South. Calif.; Mexico (Baja California).

*Stenodynerus declivatus* Bohart, 1948. Calif. Acad. Sci., Proc. (4) 24: 331, pl. 12, figs. 7, 8. ♂, ♀.

Taxonomy: Bohart, 1952. Ent. Soc. Wash., Proc. 54: 46, fig. 3.

**fulvipes fulvipes** (Saussure), n. comb. U. S. west to Mich., Ill., Kans., Okla., Tex. Ecology:

Nests in borings in wood, in old mud-dauber nests, in abandoned borings of ground-nesting bees, and also constructs its own burrows in ground. Parasite: *Anthrax a. argyropygus* Wied.; *Vespacarus fulvipes* Bak. and Cnrl. Prey: *Cymolomia* sp., Tortricidae sp.; *Characoma nilotica* Rog.

*Odynerus flavipes* Lepeletier, 1841. Hist. Nat. Ins. Hym., v. 2, p. 659. ♂. Preocc.

*Odynerus* (*Ancistrocerus*) *fulvipes* Saussure, 1855. Etudes sur la famille des Vespides, v. 3, p. 205. ♂, ♀. N. name.

Biology: Rau and Rau, 1918. Wasp Studies Afield, pp. 340-344 (nests, prey). —Rau, 1935.

Brooklyn Ent. Soc., Bul. 30: 112 (nest, prey). —Krombein, 1967. Trap-nesting wasps and bees, pp. 154-156, pl. 21, figs. 102, 104-107, pl. 22, figs. 109, 110 (nest, prey, life history, parasites).

**fulvipes rufovestis** (Bohart), n. comb. Fla., S. C. Ecology: Nests in borings in wood. Parasite:

*Vespacarus rufovestis* Bak. and Cnrl.; *Senotainia trilineata* (Wulp) (?). Prey: *Pyrausta tyralis* (Guen.), Pyraustidae sp.; *Trichotaphe* sp.; sp. of Olethreutidae or Phalonidae.

*Stenodynerus* (*Parancistrocerus*) *fulvipes rufovestis* Bohart, 1948. Fla. Ent. 31: 78. ♂, ♀.

Biology: Evans, 1956. Ent. Soc. Wash., Proc. 58: 270 (nest, prey). —Krombein, 1967.

Trap-nesting wasps and bees, pp. 156-157 (nest, life history, prey, parasites).

**histrio** (Lepeletier), n. comb. D. C. and Va. to Fla., La. Ecology: Nests in borings in wood.

Parasite: *Vespacarus histrio* Bak. and Cnrl.; *Pseudoxenos louisianae* (Pierce); *Chrysis stenodyneri* Krom. Prey: Caterpillars.

*Odynerus histrio* Lepeletier, 1841. Hist. Nat. Ins. Hym., v. 2, p. 638. ♂.

Biology: Krombein, 1955. Ent. Soc. Wash., Proc. 57: 148-149 (nest, prey, life history, parasite).

—Krombein, 1967. Trap-nesting wasps and bees, pp. 145-146 (nest, prey, life history, parasite).

**leionotus leionotus** (Viereck). Ont., U. S. except Pacific Coast states.

*Odynerus leionotus* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 198. ♀.

**leionotus yumus** (Viereck). Western Tex., N. Mex., Ariz., Colo.

*Odynerus* (*Stenodynerus*) *yumus* Viereck, 1908. Amer. Ent. Soc., Trans. 33: 397. ♂.

*Odynerus* (*Ancistrocerus*) *arizonaensis* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 208. ♀.

**macfarlandi** (Cameron). Ariz., N. Mex.; Mexico.

*Odynerus macfarlandi* Cameron, 1909. Pomona Col. Jour. Ent. 1: 79. ♀.

*Stenodynerus (Parancistrocerus) chiricahuae* Bohart, 1949. Ent. Soc. Wash., Proc. 51: 254. ♂, ♀.

**mcclayi** (Bohart), n. comb. Calif., Idaho, N. Mex.

*Stenodynerus (Parancistrocerus) mcclayi* Bohart, 1952. Ent. Soc. Wash., Proc. 54: 51, fig. 10. ♂, ♀.

**minimoferus** (Bohart), n. comb. Oreg., Calif., Ariz., Nev., Utah, Wyo., Tex. Ecology: Nests in old *Sceliphron* cells.

*Stenodynerus (Parancistrocerus) minimoferus* Bohart, 1949. Ent. Soc. Wash., Proc. 51: 256. ♂, ♀.

Taxonomy: Bohart, 1952. Ent. Soc. Wash., Proc. 54: 47, fig. 5 (male redescription).

**parapedestris arenosus** (Bohart), n. comb. Calif., Nev., Ariz.

*Stenodynerus (Parancistrocerus) parapedestris arenosus* Bohart, 1952. Ent. Soc. Wash., Proc. 54: 48. ♂, ♀.

**parapedestris parapedestris** (Bohart), n. comb. South. Calif.

*Stenodynerus (Parancistrocerus) parapedestris* Bohart, 1952. Ent. Soc. Wash., Proc. 54: 47, fig. 6. ♂, ♀.

**pedestris bifurcus** (Robertson). Fla., Ga. Ecology: Nests in borings in wood.

*Odynerus bifurcus* Robertson, 1901. Amer. Ent. Soc., Trans. 27: 196. ♂, ♀.

Biology: Krombein, 1967. Trap-nesting wasps and bees, p. 142 (nest, life history).

**pedestris pedestris** (Saussure). Que., U. S. west to N. Mex., Kans., Minn. Ecology: Nests in borings in wood, sumac and elder. Parasite: *Vespacarus pedestris* Bak. and Cunnl.;

*Pseudoxenos louisianae* (Pierce); *Toxophora amphitea* Wlkr. Prey: Gelechiidae sp.

*Odynerus (Ancistrocerus) Fuscipes* Saussure, 1853. Etudes sur la famille des Vespides, v. 1, p. 143. ♂. Preocc.

*Odynerus (Ancistrocerus) pedestris* Saussure, 1855. Etudes sur la famille des Vespides, v. 3, p. 206. N. name.

*Odynerus (Ancistrocerus) Conformis* Saussure, 1855. Etudes sur la famille des Vespides, v. 3, p. 219. ♀.

*Odynerus (Ancistrocerus) proximus* Saussure, 1857. Rev. Mag. Zool. (2) 9: 274. ♂.

*Ancistrocerus parvispinosus* Cameron, 1906. Amer. Ent. Soc., Trans. 32: 332. ♀.

*Ancistrocerus Foxeanus* Cameron, 1906. Amer. Ent. Soc., Trans. 32: 333. ♂.

*Odynerus (Ancistrocerus) acanthopus* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 223. ♀.

Taxonomy: Giordani Soika, 1941. Soc. Veneziana Stor. Nat., Bol. (n. s.) 2: 272 (generic assignment).

Biology: Rau, 1928. Acad. Sci. St. Louis, Trans. 25: 388-395 (nests, life history, parasite).

—Rau, 1935. Brooklyn Ent. Soc., Bul. 30: 110 (nest). —Krombein, 1967. Trap-nesting wasps and bees, pp. 140-142 (nest, life history, prey, parasite).

**pensylvanicus ignotatus** (Bohart), n. comb. Calif., Oreg., Wash., Idaho, Minn., Mich., N. B.

*Stenodynerus (Parancistrocerus) pensylvanicus ignotatus* Bohart, 1952. Ent. Soc. Wash., Proc. 54: 46, fig. 4. ♂, ♀.

**pensylvanicus pensylvanicus** (Saussure), n. comb. Canada and north. U. S. south to Oreg., Colo., Kans., Mo., N. C., Tex., N. Mex. Ecology: Nests in borings in twigs. Parasite:

Bombyliidae sp. Prey: Tortricidae sp.; Olethreutidae sp.

*Odynerus (Odynerus) Pensylvanicus* Saussure, 1855. Etudes sur la famille des Vespides, v. 3, p. 257. ♀.

*Odynerus (Odynerus) Huro* Saussure, 1855. Etudes sur la famille des Vespides, v. 3, p. 297. ♀.

*Odynerus (Odynerus) Mohicanus* Saussure, 1855. Etudes sur la famille des Vespides, v. 3, p. 297. ♀.

*Odynerus (Odynerus) Pennsylvanicus* Saussure, 1875. Smithsn. Inst., Misc. Collect. 254: 327. ♂, ♀. Emend.

Biology: Rau, 1928. Acad. Sci. St. Louis, Trans. 25: 395-398 (nest, life history). —Reinhard, 1929. Witchery of wasps, pp. 221-223 (nest, prey). —Rau, 1935. Brooklyn Ent. Soc., Bul. 30: 110 (nest, parasite).

- perennis anacardivora** (Rohwer). N. Y., Md., Va., N. C., S. C., Ga., Fla., La. Ecology: Nests in borings in wood and twigs. Parasite: *Vespacarus anacardivorus* Bak. and Cunn. Prey: Olethreutidae spp.; Gelechiidae sp.  
*Odynerus* (*Stenodynerus*) *anacardivora* Rohwer, 1915. U. S. Natl. Mus., Proc. 49: 241. ♀.  
Biology: Krombein, 1955. In Krombein and Evans, Ent. Soc. Wash., Proc. 57: 228-229 (nest, prey, life history, parasite). — Krombein, 1967. Trap-nesting wasps and bees, pp. 151-153 (nest, prey, life history, parasite).
- perennis perennis** (Saussure). U. S. west to Mississippi River, also Kans., Mo. Ecology: Nests in borings in twigs and sumac. Prey: Blastobasidae sp.  
*Odynerus* (*Odynerus*) *perennis* Saussure, 1857. Rev. Mag. Zool. (2) 9: 277.  
*Odynerus* (*Ancistrocerus*) *minnesotaensis* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 231. ♂.
- Biology: Rau, 1935. Brooklyn Ent. Soc., Bul. 30: 110 (nest). — Krombein, 1960. Ent. News 71: 33. (nest, prey, life history).
- polingi** (Bohart), n. comb. Southern Ariz., N. Mex.  
*Stenodynerus* (*Parancistrocerus*) *polingi* Bohart, 1949. Ent. Soc. Wash., Proc. 51: 257. ♂, ♀.
- rectangulis frazieri** (Bohart), n. comb. Calif., Oreg.  
*Stenodynerus* (*Parancistrocerus*) *rectangulis frazieri* Bohart, 1952. Ent. Soc. Wash., Proc. 54: 45, fig. 1. ♂, ♀.
- rectangulis rectangulis** (Viereck). Ariz., N. Mex.; Mexico. Ecology: Nests in borings in wood and *Sambucus* stems. Parasite: *Toxophora virgata* O. S. Prey: Caterpillars.  
*Odynerus* (*Stenodynerus*) *rectangulis* Viereck, 1908. Amer. Ent. Soc., Trans. 33: 393. ♂, ♀.
- Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 153-154 (nest, prey, life history). — Parker and Bohart, 1968. Pan-Pacific Ent. 44: 3 (nest, parasite).
- saccularis rufulus** (Bohart). Fla. Ecology: Nests in borings in wood and in old galls on scrub oak. Parasite: *Vespacarus saecularis* Bak. and Cunn.; *Megaselia aletiae* (Comst.) ?; *Amobia* ? sp.; *Anthrax a. argyropygus* Wied., *Toxophora amphitea* Wlkr.; *Melittobia chalybii* Ashm.; *Chrysis coerulans* F., *C. inaequidens* Dahlb. Prey: Olethreutidae sp.; Gelechiidae sp.; Rhyacionia sp., *Platynota rostrana* (Wlkr.), P. sp., Tortricidae sp.; Phalonidae sp.; *Pyrausta tyralis* (Guen.), *Pyraustinae* sp., *Homoeosoma* sp., Phycitinae sp., Epipaschiinae sp. Predator: *Lepidophora lepidocera* (Wied.).  
*Stenodynerus* (*Parancistrocerus*) *saecularis* (!) *rufulus* Bohart, 1948. Fla. Ent. 31: 79. ♂, ♀.
- Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 146-151 (nest, prey, life history, parasites, predator).
- salcularis salcularis** (Saussure). Tex., Ga., N. C., Va., D. C., Md., N. J.  
*Odynerus* (*Ancistrocerus*) *salcularis* Saussure, 1852. Etudes sur la famille des Vespides, v. 1, p. 122.  
*Odynerus* (*Ancistrocerus*) *Saecularis* (!) Saussure, 1853. Etudes sur la famille des Vespides, v. 1, p. 142. Misspelled *secularis*, p. 145.  
*Ancistrocerus leensis* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 215. ♂.
- siccus** (Bohart), n. comb. Colo., Utah, Wash., Calif., Ariz.; Mexico (Baja California).  
*Stenodynerus* (*Parancistrocerus*) *siccus* Bohart, 1952. Ent. Soc. Wash., Proc. 54: 50, fig. 9. ♂, ♀.
- subtoltecus** (Viereck), n. comb. Kans. (Hamilton Co.).  
*Odynerus subtoltecus* Viereck, 1906. Amer. Ent. Soc. Trans. 32: 197. ♀, (♂ misdet.). Type possibly lost.
- texensis** (Saussure). Tex., N. Mex., Ariz., southern Calif.; Mexico. Ecology: Nests in borings in wood and in old mud-dauber nests. Parasite: Saproglyphidae sp.  
*Odynerus* (*Odynerus*) *texensis* Saussure, 1870. Rev. Mag. Zool. (2) 22: 104. ♂.  
*Odynerus* (*Ancistrocerus*) *lacunus* Fox, 1894. Calif. Acad. Sci., Proc. (2) 4: 111. ♀.
- Taxonomy: Bohart, 1952. Ent. Soc. Wash., Proc. 54: 49, fig. 7 (male characters).

- Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 144-145 (nest, life history, parasite).
- toltecus** (Saussure). Wash., Oreg., Idaho, Utah, Nev., Calif., Ariz., N. Mex., western Tex.: Mexico. Ecology: Nests in borings in wood and *Sambucus*. Parasite: *Vespacarus toltecus* Bak. and Cnuli; *Toxophora virgata* O. S.; *Melittobia chalybii* Ashm.; *Chrysis barri* Boh., *C. arizonica* Boh. Prey: Gelechiidae spp.; Phycitinae sp.
- Odynerus (Odynerus) toltecus* Saussure, 1857. Rev. Mag. Zool. (2) 9: 277. ♀, ♂.
- Odynerus Packardi* Cameron, 1906. Amer. Ent. Soc., Trans. 32: 335. ♀.
- Taxonomy: Bohart, 1952. Ent. Soc. Wash., Proc. 54: 53, fig. 12 (male characters).
- Biology: Parker and Bohart, 1966. Pan-Pacific Ent. 42: 93 (nests, parasites). — Krombein, 1967. Trap-nesting wasps and bees, pp. 157-160 (nest, prey, life history, parasites).
- vagus slossonae** (Bohart), n. comb. Fla.
- Stenodynerus vagus slossonae* Bohart, 1948. Fla. Ent. 31: 77. ♀.
- vagus vagus** (Saussure), n. comb. Ont., B. C., U. S. except Pacific Coast states. Ecology: Builds multicellular mud nests attached to branches. Parasite: *Pseudoxenos louisianae* (Pierce), *P. jonesi* (Pierce); *Chrysis* sp.; *Monodontomerus mexicanus* Gahan.
- Odynerus (Odynerus) vagus* Saussure, 1857. Rev. Mag. Zool. (2) 9: 277.
- Odynerus (Odynerus) collega* Saussure, 1870. Rev. Mag. Zool. (2) 22: 61. ♂.
- Odynerus colon* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 241. ♂, ♀.
- Odynerus delodontus* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 196. ♀.
- Biology: Evans, 1956. Ent. Soc. Wash., Proc. 58: 269-270 (nest, parasite).
- vogti** (Krombein), n. comb. Md. (Plummers Island). Ecology: Nests in borings in wood. Parasite: Saprogllyphidae sp. Prey: Gelechiidae spp.; Tortricidae sp.
- Stenodynerus (Parancistrocerus) vogti* Krombein, 1962. Biol. Soc. Wash., Proc. 75: 6. ♀.
- Biology: Krombein, 1967. Trap-nesting wasps and bees, p. 151 (nest, prey, life history, parasite).

### Genus PSEUDEPIPONA Saussure

#### Genus PSEUDEPIPONA Subgenus PSEUDEPIPONA Saussure

*Pseudepipona* Saussure, 1856. Etudes sur la famille des Vespides, v. 3, p. 309. Proposed originally as a division of *Odynerus* subg. *Epipona* Shuckard; validated by Op. 893, Internatl. Comn. Zool. Nomencl., 1970.

Type-species: *Odynerus herrichii* Saussure. Monotypic.

Only the typical subgenus occurs in North America. The Palaearctic *h. herrichii* (Sauss.) nests gregariously, making short burrows in firm sandy soil and preys upon larvae of Microlepidoptera.

Taxonomy: van der Vecht, 1967. Bul. Zool. Nomencl. 24: 31 (request for validation of *Pseudepipona* Sauss., 1856). — Internatl. Comn. Zool. Nomencl., 1970 (1969). Bul. Zool. Nomencl. 26: 187, 189, 191 (validation of *Pseudepipona* Saussure (misspelled *Pseudopipona* on p. 187, and corrected in 1973 to *Pseudepipona* in Bul. Zool. Nomencl. 30: 66), type-species *Odynerus herrichii* Sauss.).

**herrichii aldrichi** (Fox). Alaska, B. C., Alta., Wash., Idaho, Mont., Wyo., Colo., Utah, N. Mex. in Canadian and Transition Zones. Typical *herrichii* (Sauss.) is widespread in the Palaearctic Region.

*Odynerus aldrichi* Fox, 1892. Ent. News 3: 197. ♂, ♀.

### Genus EUODYNERUS Dalla Torre

Some of our species belong to the subgenera *Pareuodynerus* and typical *Euodynerus*. Others belong to one or more apparently undescribed subgenera. So far as known the subgenera *Knemodynerus*, *Syneuodynerus* and *Xanthodynerus* do not occur in the New World.

Our species have quite diverse nesting habits. A few species make original mud nests on rocks and a few dig burrows in the soil. The majority of species nest in cavities in twigs, stems, struc-

tural lumber, in old mud-dauber nests, and sometimes in old *Polistes* cells. The prey in all known cases consists of caterpillars.

*Euodynerus* Dalla Torre, 1904. Gen. Ins., fasc. 19, p. 38. Proposed originally for Sect. II of Div. III of *Odynerus* subg. *Leionotus* Sauss.; validated by Op. 893, Internatl. Comn. Zool. Nomencl., 1970 (1969).

Type-species: *Vespa dantici* Rossi. Desig. by Bluethgen, 1938.

*Euodynerus* subg. *Pareuodynerus* Bluethgen, 1938 (1937). Konowia 16: 278.

Type-species: *Vespa notata* Jurine. Orig. desig.

*Euodynerus* subg. *Knemodynerus* Bluethgen, 1940. Ent. Tidskr. 61: 43.

Type-species: *Odynerus* (*Lionotus*) *excellens* Perez. Orig. desig.

*Euodynerus* subg. *Syneuodynerus* Bluethgen, 1951. Soc. Ent. Ital., Bol. 81: 75.

Type-species: *Odynerus egregius* Herrich-Schaeffer. Orig. desig.

*Euodynerus* subg. *Xanthodynerus* Bluethgen, 1954. Deut. Ent. Ztschr. 1: 265.

Type-species: *Odynerus* (*Rhynchium*) *octavus* Giordani Soika. Orig. desig.

Taxonomy: Bequaert, 1939. Ent. Soc. Amer., Ann. 32: 61-65 (color forms of *annectens* (Sauss.)). — Bohart, 1939. Brooklyn Ent. Soc., Bul. 34: 245-251 (Boscii Group). — Bohart, 1942. Pan-Pacific Ent. 18: 145-152 (Congressus Group). — Bohart, 1948. Brooklyn Ent. Soc., Bul. 43: 81-87 (subsp. of *foraminatus* (Sauss.)), *fusus* (Cr.), *tempiferus* (Vier.)). — van der Vecht, 1967. Bul. Zool. Nomencl. 24: 29-30 (genotype). — Internatl. Comn. Zool. Nomencl., 1970. Bul. Zool. Nomencl. 26: 187-188 (validation of *Euodynerus* D. T., type-species *Vespa dantici* Rossi).

**alvarado alvarado** (Saussure). Ariz., N. Mex.; Mexico.

*Odynerus* (*Odynerus*) *Alvarado* Saussure, 1857. Rev. Mag. Zool. (2) 9: 276.

*Odynerus Alvaradi* Saussure, 1875. Smithsn. Inst., Misc. Collect. 254: 268. ♂, ♀. Emend.

*Odynerus* (*Pachodynerus*) *halmus* Cameron, 1905. Amer. Ent. Soc., Trans. 31: 389. ♂, ♀.

**alvarado safranum** (Bohart). Western Tex.

*Rygchium alvarado safranum* Bohart, 1948. Brooklyn Ent. Soc., Bul. 43: 86. ♂, ♀.

**annectens** (Saussure). Va., Ga., Fla. Ecology: The only nest described was of coarse sandy clay with 21 kidney-shaped cells surrounding a twig.

*Odynerus* (*Odynerus*) *annectens* Saussure, 1870. Rev. Mag. Zool. (2) 22: 59. ♀.

*Odynerus tempiferus* var. *macio* Bequaert, 1936. U. S. Natl. Mus., Proc. 84: 81. ♂, ♀.

Biology: Clark and Sandhouse, 1936. U. S. Natl. Mus., Proc. 84: 89-95 (nest).

**annulatus annulatus** (Say). Ariz., Utah, Wyo. east to Tex., Kans., N. Dak., Alta.; north.

Mexico. Ecology: Nests in ground and builds curved mud tube above entrance; the cells diverge leaflike from the main burrow. Parasite: *Pseudoxenos hookeri* (Pierce). Prey: *Loxostege sticticalis* (L.).

*Odynerus annulatus* Say, 1824. In Keating, Narr. Long's 2nd Exped., v. 2, p. 348. ♂, ♀.

*Odynerus* (*Odynerus*) *Bairdi* Saussure, 1858. Rev. Mag. Zool. (1) 10: 169. ♂.

*Odynerus verus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 237. ♂, ♀.

*Odynerus ruficandis* Cameron, 1906. Amer. Ent. Soc., Trans. 32: 328. ♀.

*Pterochilus* (!) *maculifrons* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 226. ♀.

*Odynerus annulatus* var. *birkmanni* Cameron, 1909. Pomona Col. Jour. Ent. 1: 124. ♂, ♀.

*Odynerus annulatus* var. *oslari* Cameron, 1909. Pomona Col. Jour. Ent. 1: 125.

*Odynerus sulciventris* Cameron, 1909. Pomona Col. Jour. Ent. 1: 130. ♀.

Biology: Hungerford and Williams, 1912. Ent. News 23: 250-253, pl. 14, figs. 5, 6 (nest, prey). — Isely, 1914. Kans. Univ. Sci. Bul. (2) 8: 277-281 (nest, prey). — Rau and Rau, 1918. Wasp Studies Afield, pp. 300-312 (nest, prey).

**annulatus arvensis** (Saussure). U. S. west to Tex., Okla., Kans., Nebr., S. Dak., N. Dak.

Ecology: Makes vertical ground burrows with one to six cells topped by a thick-walled erect or bent chimney about 1 inch long. Parasite: *Pseudoxenos hookeri* (Pierce). Prey: *Loxostege sticticalis* (L.), *Elasmopalpus fufurellus* Hlst., Pyralidae spp.; Noctuidae sp. Predator: *Solenopsis* sp.

*Odynerus* (*Odynerus*) *arvensis* Saussure, 1870. Rev. Mag. Zool. (2) 22: 59. ♂, ♀.

*Odynerus cultus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 236. ♂.

*Odynerus firmus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 239. ♂, ♀.

*Odynerus geminus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 240. ♀.



*Odynerus orasus* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 196. ♂, ♀.

Biology: Isely, 1914. Kans. Univ. Sci. Bul. (2) 8: 271-276 (nest, prey, predator). — Evans, 1956. Ent. Soc. Wash., Proc. 58: 267-268, figs. 1, 2 (nest, prey).

**annulatus evectus** (Cresson). Southwest U. S. including Tex., N. Mex., Ariz., Calif.; Mexico (Baja California).

*Odynerus evectus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 235. ♀.

Biology: Linsley, 1962. Ent. Soc. Amer., Ann. 55: 153-154 (sleeping habits).

**annulatus imperialis** (Bohart). Southern Calif., Nev., Ariz., southwestern Utah; Mexico.

*Rygiichium sulphureum imperialis* Bohart, 1945. Ent. Soc. Wash., Proc. 47: 48. ♂, ♀.

**annulatus sulphureus** (Saussure). Calif., Oreg., Wash., B. C., Idaho, Nev., Utah, Ariz. Parasite: *Pseudoxenos hookeri* (Pierce).

*Odynerus (Odynerus) sulphureus* Saussure, 1858. Rev. Mag. Zool. (2) 10: 170. ♀.

**auranus albivestis** (Bohart). Alta., Wash., Idaho, eastern Oreg., N. Dak., S. Dak., Wyo., Colo.

*Odynerus boscii albivestis* Bohart, 1939. Brooklyn Ent. Soc., Bul. 34: 249. ♂, ♀.

**auranus aquilus** Bohart. West. Kans. to west. Tex., west to Ariz.; Mexico (Coahuila, Durango).

*Euodynerus auranus aquilus* Bohart, 1974. Kans. Ent. Soc., Jour. 47: 463. ♂, ♀.

**auranus auranus** (Cameron). Calif., Oreg., Wash., Nev., Utah, Wyo., Colo. Ecology: Nests in the ground, making clumps of five or six complete jug-shaped mud pots. Parasite: *Sphaerophthalma orestes* (Fox).

*Odynerus auranus* Cameron, 1906. Invertebrata Pacifica, v. 1, p. 148. ♂.

**auranus azotopus** (Bohart). Southern Nev., Ariz., southeastern Calif.; Mexico (Baja California).

*Odynerus boscii azotopus* Bohart, 1939. Brooklyn Ent. Soc., Bul. 34: 248. ♂, ♀.

**barberi** (Bohart), n. comb. Tex. (Brownsville).

*Rygiichium barberi* Bohart, 1945. Ent. Soc. Wash., Proc. 47: 56. ♀.

**bidens** (Saussure), n. comb. Fla., S. C., Tenn., N. J., Minn.

*Odynerus (Odynerus) bidens* Saussure, 1870. Rev. Mag. Zool. (2) 22: 58. ♂, ♀.

**boscii boharti** (Krombein). Fla.

*Rygiichium molestum boharti* Krombein, 1959. Ent. Soc. Wash., Proc. 61: 145, fig. 1. ♂, ♀.

**boscii boscii** (Lepeletier). N. C. to northern Fla.

*Odynerus boscii* Lepeletier, 1841. Hist. Nat. Ins. Hym. 2: 637. ♂.

**boscii molestus** (Saussure). Eastern U. S. to northern Fla., west to Kans., Okla. and Tex.

Ecology: Nests in borings in wood, and in burrows in structural lumber. Parasite:

*Macrosiagon c. cruentum* (Germ.); Chrysididae sp. Prey: *Desmia funeralis* (Hbn.),

*Framinghamia helvalis* (Wlkr.), Pyraustinae sp., *Tetralopha* sp., Epipaschiinae sp.

*Odynerus (Odynerus) turpis* Saussure, 1870. Rev. Mag. Zool. (2) 22: 60. ♀.

*Odynerus (Odynerus) molestus* Saussure, 1870. Rev. Mag. Zool. (2) 22: 61. ♂.

*Odynerus manifestus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 240. ♂, ♀. Preocc.

*Odynerus primus* Dalla Torre, 1889. Wien. Ent. Ztg. 8: 125. N. name.

Taxonomy: Krombein, 1959. Ent. Soc. Wash., Proc. 61: 148-149 (as first reviser, synonymized *turpis* under *molestus*).

Biology: Krombein, 1958. Ent. Soc. Wash., Proc. 60: 101 (prey, nest). — Krombein, 1967.

Trap-nesting wasps and bees, pp. 83-84 (nest, prey, life history, parasites).

**castigatus castigatus** (Saussure). Most of U. S., particularly more southern states; Mexico.

Predator: *Philaenus zebratus nitens* (Bks.).

*Odynerus (Leionotus) Castigatus* Saussure, 1853. Etudes sur la famille des Vespides, v. 1, p. 178. ♀, ♂.

*Odynerus fuscus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 238. ♂, ♀.

*Odynerus fuscus* (!) Dalla Torre, 1904. Gen. Ins., fasc. 19, p. 45.

**castigatus rubrivestis** (Bohart). Fla., Ga.

*Rygiichium fuscum rubrivestis* Bohart, 1948. Brooklyn Ent. Soc., Bul. 4: 84. ♂, ♀.

**castigatus sanneovestis** (Bohart). Calif. (Owens Valley).

*Rygiichium fuscum sanneovestis* Bonart, 1948. Brooklyn Ent. Soc., Bul. 4: 84. ♂, ♀.

- cockerelli** (Cameron). Pacific Coast states, Idaho, in Upper Sonoran and Transition Zones.  
 Ecology: Constructs vertical ground burrows as nesting sites.  
*Ancistrocerus cockerelli* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 220. ♀.  
*Odynerus infuscipennis* Bohart, 1942. Pan-Pacific Ent. 18: 146. ♂, ♀.
- congressus** (Viereck), n. comb. Tex., N. Mex., Ariz., Calif., Nev., L. Sonor. Zone; Mexico.  
*Odynerus (Stenodynerus) congressus* Viereck, 1908. Amer. Ent. Soc., Trans. 33: 405. ♀.
- crypticus balteatus** (Say). N. Y., Pa., N. J., Va., Ind., Ohio, Mich., Ill., Tex., Utah, Ont.  
*Rygiichium balteatum* Say, 1837. Boston Jour. Nat. Hist. 1: 383. ♀.  
*Monobia Sylvatica* Saussure, 1852. Etudes sur la famille des Vespides, v. 1, p. 95. ♀.
- crypticus crypticus** (Say). Ont., Alta., U. S. west to S. Dak., Wyo., Colo., Utah, Ariz.; Mexico.  
 Ecology: Nests in small colonies, making vertical ground burrows usually with about three cells, one above the other, separated by clay partitions. Parasite: Bombyliidae sp.; Miltogrammini sp.; *Chrysis* sp. Prey: *Pyrgus c. communis* (Grt.), *Pholisora catullus* (F.).  
*Odynerus crypticus* Say, 1823. West. Quart. Rptr. 2: 81.  
*Rygiichium Louisianum* Saussure, 1852. Etudes sur la famille des Vespides, v. 1, p. 106. ♀.  
*Odynerus (Odynerus) Iturbide* Saussure, 1857. Rev. Mag. Zool. (2) 9: 276.  
*Odynerus designatus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 235. ♀.  
*Odynerus Iturbidi* (!) Saussure, 1875. Smithsn. Inst., Misc. Collect. 254: 265. ♂.
- Biology: Isely, 1914. Kans. Univ. Sci. Bul. (2) 8: 281-294 (nest, prey, parasites). —Rau and Rau, 1918. Wasp Studies Afield, pp. 312-331 (nest, prey, life history, parasite). —Turner, 1922. Biol. Bul. 42: 153-172. —Rau, 1931. Brooklyn Ent. Soc., Bul. 26: 5-6. —Vest, 1936. Utah Acad. Sci. Arts and Letters, Proc. 13: 207-209. —Rau, 1945. Brooklyn Ent. Soc., Bul. 40: 29-30 (carnivorous habit, adult).
- crypticus stricklandi** (Bequaert). Alta., Wyo., S. Dak., Nebr., Colo.  
*Odynerus dorsalis stricklandi* Bequaert, 1940. Canad. Ent. 72: 55. ♂, ♀.
- delicatus** (Cresson), n. comb. Tex.  
*Odynerus delicatus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 236. ♀.
- digiticornis** (Bohart), n. comb. Ariz., Utah; Mexico (Baja California).  
*Odynerus canaliculatus* Viereck, 1906. Amer. Ent. Soc., Trans. 33: 392. ♂. Preocc.  
*Rygiichium digiticornis* Bohart, 1945. Ent. Soc. Wash., Proc. 47: 49. ♂. N. name.
- discogaster** (Bequaert), n. comb. Calif., Oreg., Wash., B. C., Idaho, Nev., Ariz., Colo., Wyo.  
 Ecology: Makes mud nests in cracks between rocks, with about three cells in a clump.  
*Odynerus discogaster* Bequaert, 1939. Ent. Soc. Amer., Ann. 32: 65. ♂, ♀.
- exoglyphus albiovittatus** (Bohart), n. comb. Great Basin area including Wash., Oreg., Calif., Nev., Idaho, Wyo., Colo., N. Mex.  
*Odynerus exoglyphus albiovittatus* Bohart, 1939. Brooklyn Ent. Soc., Bul. 34: 251. ♂, ♀.
- exoglyphus exoglyphus** (Bohart), n. comb. Calif., Oreg., Idaho, Utah, Wyo., northern Ariz.  
*Odynerus exoglyphus* Bohart, 1939. Brooklyn Ent. Soc., Bul. 34: 250. ♂, ♀.
- foraminatus aequalis** (Cameron). Western Tex. to Ariz., Colo., Utah, Idaho, Oreg. and Wash. in Upper Sonoran Zone. Ecology: Nests in old mud-dauber cells.  
*Odynerus aequalis* Cameron, 1906. Amer. Ent. Soc., Trans. 32: 329. ♀.  
*Odynerus sapellvensis* Cameron, 1906. Amer. Ent. Soc., Trans. 32: 331.  
*Odynerus sulfuritinctus* Viereck, 1908. Amer. Ent. Soc., Trans. 33: 389. ♂, ♀.  
*Odynerus spectabiliformis* Viereck, 1908. Amer. Ent. Soc., Trans. 33: 390. ♂, ♀.  
*Odynerus hidalgoformis* Viereck, 1908. Amer. Ent. Soc., Trans. 33: 391. ♀.  
*Odynerus spectabiliformis* (!) Viereck, 1908. Amer. Ent. Soc., Trans. 33: 391.  
*Odynerus spelloensis* (!) Cameron, 1909. Pomona Col. Jour. Ent. 1: 125. ♂, ♀.  
*Odynerus deficiens* Cameron, 1909. Pomona Col. Jour. Ent. 1: 126. ♂.  
*Odynerus jeromensis* Cameron, 1909. Pomona Col. Jour. Ent. 1: 131. ♂.
- Biology: Isely, 1914. Kans. Univ. Sci. Bul. (2) 8: 299 (nest).
- foraminatus apopkensis** (Robertson). Central to southern Fla. Ecology: Nests in borings in wood. Parasite: *Pyemotes* sp.; *Pseudoxenos hookeri* (Pierce); *Macrosiagon c. cruentum* (Germ.); *Toxophora* sp.; *Amobia floridensis* (Tns.), *A. erythrura* (Wulp); *Chrysis coeruleans* F., *C. inaequidens* Dahlb., *C. derivata* Buys. Prey: *Olethreutidae* sp.

primarily; *Platynota* sp., Tortricidae sp., occasionally. Predator: *Lepidophora lepidocera* (Wied.) ?

*Odynerus apokpensis* Robertson, 1901. Amer. Ent. Soc., Trans. 27: 196. ♂.

Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 62-70, pl. 25, fig. 119 (nest, prey, life history, parasites, predator).

**foraminatus blakeanus** (Cameron). Tex. (Lee Co.).

*Odynerus blakeanus* Cameron, 1909. Pomona Col. Jour. Ent. 1: 80. ♀.

*Rygichium rugosum fedoris* Bohart, 1945. Ent. Soc. Wash., Proc. 47: 46. ♂, ♀.

**foraminatus foraminatus** (Saussure). Southern Canada, U. S. west to Rocky Mts. Ecology:

Nests in hollow twigs, burrows in logs, borings in wood, and old *Polistes* cells. Parasite: *Anthrax irroratus* Say; *Megaselia aetiae* (Comst.); *Pseudoxenos hookeri* (Pierce), *P. foraminati* Pierce; *Pimpla spatulata* Tow.; *Melittobia chalybii* Ashm.; *Lycogaster pullata* Shuck.; *Chrysis coerulans* F., *C. nitidula* F., *C. inaequidens* Dahlb. ? Prey: *Gnorimoschema solidaginis* (Riley), Gelechiidae spp.; Oecophoridae spp.; Olethreutidae sp.; *Archips* sp., *Enarmonia* sp., Tortricidae spp.; *Thyris maculata* Harr.; *Desmia funeralis* (Hbn.), *Loxostege* sp., Pyraustinae spp., *Acrobasis* sp., Pyralidinae sp., *Epipaschia superatilis* Clem.

*Odynerus* (*Odynerus*) *Rugosus* Saussure, 1853. Etudes sur la famille des Vespides, v. 1, p. 179. ♂.

*Odynerus* (*Odynerus*) *Foraminatus* Saussure, 1853. Etudes sur la famille des Vespides, v. 1, p. 180. ♂, ♀.

*Odynerus* (*Odynerus*) *flavopictus* Saussure, 1857. Rev. Mag. Zool. (2) 9: 276.

*Odynerus Harringtoni* Cameron, 1906. Amer. Ent. Soc., Trans. 32: 327. ♀.

*Odynerus santa-feae* Cameron, 1906. Amer. Ent. Soc., Trans. 32: 330. ♀.

Biology: Hungerford and Williams, 1912. Ent. News 23: 255 (nest). —Rau and Rau, 1918.

Wasp Studies Afield, PP. 334-340 (nest, prey, parasite). —Rau, 1922. Acad. Sci. St. Louis, Trans. 24, no. 7: 17-18 (nest). —Rau, 1928. Acad. Sci. St. Louis, Trans. 25: 398-400 (nest, life history). —Rau, 1932. Ent. News 53: 119-121 (nest). —Rau, 1935. Brooklyn Ent. Soc., Bul. 30: 110-111 (cocoon). —Rau, 1944. Canad. Ent. 76: 129 (nest). —Hartman, 1944. Psyche 51: 1-4 (egg-laying). —Cooper, 1954. Ent. Soc. Wash., Proc. 56: 281-282 (nest, parasite).

—Medler, 1964. Ent. Soc. Amer., Ann. 57: 56-60 (nest, prey, life history, parasites).

—Markin, 1965. Ent. Soc. Amer., Ann. 58: 132-133, fig. 1 (nest, life history). —Krombein, 1967. Trap-nesting wasps and bees, pp. 56-62 (nest, prey, life history, parasites, predator).

**foraminatus parvirudis** (Bohart). Fla., S. C.

*Rygichium foraminatum parvirudis* Bohart, 1948. Brooklyn Ent. Soc., Bul. 4: 83. ♂, ♀.

**foraminatus scutellaris** (Saussure). Idaho, Oreg., Calif., Nev. Ecology: Nests in cavities in *Sambucus* and in twigs, and in old mud-dauber nests. Parasite: *Pseudoxenos hookeri* (Pierce); *Anthrax irroratus* Say; *Amobia floridensis* (Tns.); *Epistenia* sp.; *Lycogaster pullata nevadensis* (Cr.); *Chrysis coerulans* F., *C. derivata* Buyss., *C. parkeri* Moore, *C. inaequidens* Dahlb. Predator: *Trichodes ornatus* Say.

*Odynerus* (*Odynerus*) *scutellaris* Saussure, 1870. Rev. Mag. Zool. (2) 22: 58. ♂.

*Odynerus visellus* Cameron, 1906. Invertebrata Pacifica 1: 147. ♂.

*Ancistrocerus rivularis* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 215. ♂.

*Odynerus blandinus* Rohwer, 1917. U. S. Natl. Mus., Proc. 53: 236. ♂, ♀.

Taxonomy: Goodpasture, 1974. Kans. Ent. Soc., Jour. 47: 364-372, figs. 7, 8 (chromosome number).

Biology: Parker and Bohart, 1966. Pan-Pacific Ent. 42: 93 (nest, parasites). —Parker and Bohart, 1968. Pan-Pacific Ent. 44: 2 (nest, predator).

**guerrero** (Saussure). Western Tex., N. Mex., Ariz., Mexico (Baja California). Ecology: Nests in borings in wood. Parasite: *Chrysis arizonica* Boh., *C. inflata* Aar. Prey: Pyraustinae sp.; Noctuidae sp.

*Odynerus* (*Odynerus*) *Guerrero* Saussure, 1857. Rev. Mag. Zool. (2) 9: 277.

*Odynerus Guerrieri* Saussure, 1875. Smithsn. Inst., Misc. Collect. 254: 294. ♂, ♀. Emend.

Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 81-83, pl. 9, fig. 41 (nest, prey, life history, parasites).

**hidalgo boreoorientalis** (Bequaert). East Coast states, Ohio, Mo., eastern Kans. Ecology:

Nests in borings in wood. Prey: *Homoeosoma electellum* (Hlst.).

*Odynerus hidalgo* var. *boreo-orientalis* Bequaert, 1937. Pan-Pacific Ent. 12: 11. ♂, ♀.

Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 77-79 (nest, prey, life history).

**hidalgo hidalgo** (Saussure). U. S. east to Miss., north to Mo., Kans., Colo., Calif.; Mexico.

Ecology: Nests in abandoned bee burrows in a cliff, in a *Sceliphron* mud nest, and in an old *Polistes* nest. Prey: Caterpillars.

*Odynerus* (*Odynerus*) *Hidalgo* Saussure, 1857. Rev. Mag. Zool. (2) 9: 275.

*Odynerus ductus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 238. ♂, ♀.

*Odynerus hidalgo* var. *boreo-occidentalis* Bequaert, 1937. Pan-Pacific Ent. 12: 13. ♂, ♀. Emend.

Biology: Isely, 1914. Kans. Univ. Sci. Bul. (2) 8: 296-299 (nest, prey). —Bequaert, 1939. Ent.

Soc. Amer., Ann. 32: 68-69 (nest). —Rau, 1943. Ent. Soc. Amer., Ann. 36: 533 (nest).

—Linsley, 1962. Ent. Soc. Amer., Ann. 55: 154 (sleeping habits).

**hidalgo viereckii** (Cameron). Calif., Nev., Utah, Idaho, Wash., Colo. Ecology: Nests in old *Sceliphron* mud nests, dividing each cell transversely in two.

*Odynerus viereckii* Cameron, 1909. Pomona Col. Jour. Ent. 1: 127. ♀.

*Odynerus hidalgo* var. *boreo-occidentalis* Bequaert, 1937. Pan-Pacific Ent. 12: 13. ♂, ♀.

**leucomelas leucomelas** (Saussure). North. and west. U. S. and Canada south to mountains of

Tenn., N. Mex., Ariz. Ecology: Nests in cavities in sumac twigs. Parasite: *Amobia*

*distorta* (Allen); *Chrysis coerulans* F., *C. nitidula* F. ? Prey: *Sarothrips* sp., *Palthis*

*angulalis* (Hbn.); *Rheumaptera hastata* L. ?; *Framinghamia helvalis* (Wlkr.),

*Tetralopha* spp., *Acrobasis* spp., *Dioryctria reniculella* Grt., *D.* spp.; Pterophoridae sp.;

*Olethreutidae* sp.; *Badebecia urticana* Hbn., *Exartema* spp., *Griselda radicans* Walsh,

*Rhopobota naevana geminana* Steph., *Pseudexentera* spp., *Sparganothis reticulatana*

Clem., S. sp., *Platynota* sp., *Pandemis* spp., *Archips argyrosipilus* Wlkr., A. spp., *C.*

*rosaceana* Harr., *C. fumiferana* (Clem.), *C. pinus* Free., *Argyrotaenia velutinana* Wlkr.

?, *Acleris variaria* Fern., *A. logiana placidana* Rob., A. sp.; *Recurvaria* spp., *Eucordylea*

spp., *Trichotapha levisella* Fyles ?, T. spp., Gelechiidae spp.

*Odynerus* (*Odynerus*) *Leucomelas* Saussure, 1855. Etudes sur la famille des Vespides, v. 3, p. 255. ♂, ♀.

Biology: Medler, 1964. Ent. News 75: 26-27 (nest, life history, parasite). —Fye, 1965. Canad.

Ent. 97: 718-722 (nest, prey, life history, parasites).

**leucomelas oregonensis** (Bohart). Wash., Oreg., Nev., Utah, Wyo.

*Rygius foraminatum oregonense* Bohart, 1948. Brooklyn Ent. Soc., Bul. 43: 82. ♂, ♀.

**macswaini** (Bohart), n. comb. Calif. in Transit. Zone.

*Rygius macswaini* Bohart, 1948. Brooklyn Ent. Soc., Bul. 43: 80. ♂, ♀.

**martini** (Bohart), n. comb. Tex., Colo., N. Mex., Ariz., Utah.

*Odynerus martini* Bohart, 1942. Pan-Pacific Ent. 18: 149. ♂, ♀.

**megaera** (Lepeletier). East. and south. U. S. north to N. Y., Ill., Pa., west to eastern Tex., Okla.

Ecology: Nests in borings in wood. Parasite: *Toxophora amphitea* Wlkr., *Anthrax*

*aterrimus* (Big); *Chrysis coerulans* F., *C. inaequidens* Dahlb. Prey: *Archips* sp.,

*Platynota* sp., Tortricidae spp.; *Desmia funeralis* (Hbn.), *Framinghamia helvalis*

(Wlkr.), *Tetralopha* sp., *Epipaschiinae* sp., *Nephopteryx nyssaeolella* (Dyar), *N. uvinella*

(Rag.), Phycitinae sp.; *Psilocorsis* sp.; *Olethreutidae* sp.; *Palthis angulalis* Hbn.

*Odynerus megaera* Lepeletier, 1841. Hist. Nat. Ins. Hym., v. 2, p. 636. ♀.

Biology: Krombein, 1955. Ent. Soc. Wash., Proc. 57: 146-147 (nest, prey, life history).

—Krombein, 1967. Trap-nesting wasps and bees, pp. 70-74, pl. 9, fig. 40, pl. 26, figs. 123,

124 (nest, prey, life history, parasites).

**oslarensis** (Cameron). Calif., Ariz. Ecology: Nests in borings in *Sambucus* stems and wood.

Prey: Phycitinae sp.; Gelechiidae sp.; Cosmopterigidae sp.

*Odynerus* (*Pachyodernus* (!)) *oslarensis* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 199. ♀.

Biology: Parker and Bohart, 1966. Pan-Pacific Ent. 42: 93 (nest). —Krombein, 1967.

Trap-nesting wasps and bees, pp. 84-85 (nest, life history, prey).

- planitarsis** (Bohart), n. comb. South. Canada, Maine, N. H., Mich., Wis., Minn., Colo.  
*Rygchium planitarsis* Bohart, 1945. Ent. Soc. Wash., Proc. 47: 45. ♂, ♀.
- pratensis brumalis** (Bequaert). Wash., Oreg., northeastern Calif., Idaho, Nev.  
*Odynerus pratensis* var. *brumalis* Bequaert, 1936. U. S. Natl. Mus., Proc. 84: 86. ♂.
- pratensis pratensis** (Saussure). Ont., Southwest. U. S. east to Kans., Tex., west to Calif.; Mexico. Ecology: Nests in *Sambucus* stems and wood. Parasite: *Macrosiagon c. cruentum* (Germ.)?; *Toxophora* sp.; *Trichrysis mucronata* (Br.). Prey: Caterpillars.  
*Odynerus (Odynerus) pratensis* Saussure, 1870. Rev. Mag. Zool. (2) 22: 61. ♂, ♀.  
*Odynerus elusinus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 234. ♂, ♀.  
*Odynerus egregius* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 197. ♂. Preocc.  
*Odynerus congressensis* Cameron, 1909. Pomona Col. Jour. Ent. 1: 132. ♂, ♀.
- Biology: Parker and Bohart, 1966. Pan-Pacific Ent. 42: 93 (nest). — Krombein, 1967. Trap-nesting wasps and bees, pp. 79-81 (nest, prey, life history, parasites). — Parker and Bohart, 1968. Pan-Pacific Ent. 44: 2 (nest).
- provisoreus** (Viereck), n. comb. Ariz., southern Colo.  
*Odynerus (Stenodynerus) provisorius* Viereck, 1908. Amer. Ent. Soc., Trans. 33: 396. ♂.
- russatus** (Bohart), n. comb. Calif., Ariz., Utah, N. Mex., Tex. in L. Sonor. Zone; Mexico (Coahuila).  
*Odynerus russatus* Bohart, 1942. Pan-Pacific Ent. 18: 150, figs. 2, 9, 14. ♂, ♀.
- schwarzi** (Krombein). N. J., Pa., Md., D. C., Va., Okla. Ecology: Nests in borings in wood. Parasite: *Toxophora amphitea* Wlkr.; *Melittobia chalybii* Ashm.; *Chrysis nitidula* F. Prey: *Gelechia albisparsella* (Chamb.); *Psilocorsis* sp.; Tortricidae sp.; *Lorostege mancalis* (Led.).  
*Rygchium schwarzi* Krombein, 1962. Biol. Soc. Wash., Proc. 75: 5. ♂, ♀.
- Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 74-77, pl. 9, fig. 39 (nest, prey, life history, parasites).
- tempiferus birepandus** (Bohart). Nev. (Charleston Mountain Park).  
*Rygchium tempiferum birepandum* Bohart, 1948. Brooklyn Ent. Soc. Bul. 43: 86. ♂.
- tempiferus eldoradensis** (Rohwer). B. C., Northwest. U. S. including Calif., Oreg., Wash., Nev., Idaho, Mont., Wyo., Colo.  
*Odynerus eldoradensis* Rohwer, 1917. U. S. Natl. Mus., Proc. 53: 238. ♂.  
*Odynerus robustus* Rohwer, 1917. U. S. Natl. Mus., Proc. 53: 238. ♀. Preocc.
- tempiferus pritchardi** (Bequaert). Okla.  
*Odynerus annectens* var. *pritchardi* Bequaert, 1939. Ent. Soc. Amer., Ann. 32: 63. ♀.
- tempiferus subrubeus** (Bohart). Utah, Colo.  
*Rygchium tempiferum subrubeum* Bohart, 1948. Brooklyn Ent. Soc., Bul. 43: 85. ♂, ♀.
- tempiferus tempiferus** (Viereck). Ariz., N. Mex., southern Colo., Utah, Wyo., S. Dak.  
*Odynerus (Stenodynerus) tempiferus* Viereck, 1908. Amer. Ent. Soc., Trans. 33: 392. ♂.  
*Odynerus trichosomus* Cameron, 1909. Pomona Col. Jour. Ent. 1: 127. ♂.
- tetralobus** (Bohart), n. comb. Calif.  
*Odynerus tetralobus* Bohart, 1942. Pan-Pacific Ent. 18: 148. ♂, ♀.

#### Genus MONOBIA Saussure

*Monobia* Saussure, 1852. Etudes sur la famille des Vespides, v. 1, p. 94.

Type-species: *Vespa quadridens* Linnaeus Desig. by Ashmead, 1902.

*Triarthra* Dalla Torre, 1904. Gen. Ins., fasc. 19, p. 28. Preocc.

Type-species: *Odynerus cyanipennis* Guerin. Desig. by Bequaert, 1940.

*Tetrathra* Dalla Torre, 1904. Gen. Ins., fasc. 19, p. 28.

Type-species: *Vespa quadridens* Linnaeus. Desig. by Bequaert, 1940.

Most species occur in Central and South America. Nesting habits have been recorded for only a few species. The preferred nesting sites are in pre-existing cavities. Caterpillars are stored as prey.

Revision: Bequaert, 1940. Rev. de Ent. 11: 822-842 (New World spp.)

**quadridens** (Linnaeus). N. H. to Fla., west to Wis., Ill., Kans. and N. Mex. Ecology: Nesting sites are in pre-existing cavities such as carpenter bee tunnels, hollow stems, old mud-dauber cells, and occasionally in old burrows of ground-nesting bees. The nests consist of a linear series of cells separated by mud partitions; usually there is an empty intercalary cell between each stored cell. Parasite: *Tortonia quadridens* Bak.; *Monobiacarus quadridens* Bak. and Cuni.; *Anthrax aterrimus* (Big.); *Amobia erythrura* (Wulp); *Megaselia aletiac* (Comst.); *Pseudoxenos bishoppi* (Pierce); *Melittobia chalybii* Ashm.; *Chrysis smaragdula* F., *C. inaequidens* Dahlb. Prey: *Nephopteryx uvinella* (Rag.), *N. sp.*, Phycitinae sp., *Epipaschia superatilis* Clem., *E. sp.*, *Tetralopha asperatella* (Clem.), *T. sp.*, *Epipaschiinae* sp., *Desmia funeralis* (Hbn.), *Pyraustinae* sp.; *Stenomoma schlaegeri* Zell., *S. sp.*, *Stenomidae* sp.; *Psilocorsis* sp.; *Gelechiidae* spp.; *Platynota* sp., Tortricidae spp. Predator: *Lecontella cancellata* (LeC.), *Cleridae* sp.; *Dermestidae* sp.

*Vespa quadridens* Linnaeus, 1763. Centuria Ins. Rar., p. 31.

*Vespa quadricornis* (!) Degeer, 1773. Mem. pour Servir a l'Hist. des Ins., v. 3, p. 584. Lapsus.

*Vespa cincta* Degeer, 1773. Mem. pour Servir a l'Hist. des Ins., v. 3, p. 584. Preocc.

*Vespa uncinata* Fabricius, 1775. Systema Ent. p. 367.

*Vespa incincta* (!) Fabricius, 1804. Systema Piezatorum, p. 259. Lapsus.

Biology: Ashmead, 1894. Psyche 7: 76-78 (nest). —Tandy, 1908. Ent. News 19: 231-232 (nest).

—Rau and Rau, 1918. Wasp Studies Afield, pp. 346-354 (nest, prey, life history). —Rau,

1922. Acad. Sci. St. Louis, Trans. 24, no. 7: 16 (nest). —Rau, 1926. Acad. Sci. St. Louis,

Trans. 25: 199-200 (nest). —Reinhard, 1929. Witchery of Wasps, p. 86 (nest). —Rau, 1931.

Brooklyn Ent. Soc., Bul. 26: 4-6 (lack of cocoon). —Rau, 1935. Ent. News 46: 57-58

(courtship, mating). —Frost, 1944. Ent. News 55: 10-14 (nest, prey, life history).

—Krombein, 1958. Ent. Soc. Wash., Proc. 60: 101 (prey). —Krombein, 1967. Trap-nesting

Wasps and Bees, pp. 46-56, pl. 7, figs. 24-29, pl. 8, figs. 30-38 (nest, prey, life history,

associates). —Byers, 1972. Kans. Ent. Soc., Jour. 45: 235-238 (supersedes in *Osmia*

*lignaria* Say nests, nest, prey).

**texana** (Cresson). Tex., Ariz.; Mexico (Baja California, Sonora, Veracruz).

*Odynerus texanus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 234. ♀.

*Monobia Californica* Saussure, 1875. Smithsn. Inst., Misc. Collect. 254: 129. ♂.

*Monobia variabilis* Saussure, 1875. Smithsn. Inst., Misc. Collect. 254: 137. ♀.

### Genus MONTEZUMIA Saussure

*Montezumia* Saussure, 1852. Etudes sur la famille des Vespides, v. 1, p. 87.

Type-species: *Montezumia rufidentata* Saussure. Desig. by Ashmead, 1902.

*Alpha* Saussure, 1855. Etudes sur la famille des Vespides, v. 3, p. 160.

Type-species: *Montezumia rufidentata* Saussure. Desig. by Bohart, 1951.

*Beta* Saussure, 1855. Etudes sur la famille des Vespides, v. 3, p. 162.

Type-species: *Montezumia morosa* Saussure. Desig. by Bequaert, 1921.

*Metazumia* Saussure, 1875. Smithsn. Inst., Misc. Collect. 254: 114.

Type-species: *Montezumia huasteca* Saussure. Desig. by Bequaert, 1921.

*Eumontezumia* Dalla Torre, 1904. In Wytsman, Gen. Ins., fasc. 19, p. 27. N. name.

Most species are restricted to America south of U. S. Two of the Neotropical species are supposed to build mud nests, but it has been suggested for one of them that it merely used abandoned mud-dauber nests. One species is reported as preying upon caterpillars.

Taxonomy: Bequaert, 1921. Rev. Zool. Afric. 9: 242-247 (diagnosis of typical subgenus, list of spp.). —Bequaert, 1940. Ent. Soc. Amer., Ann. 33: 96 (raises typical subgenus to generic rank).

**arizonensis** Bequaert. Southern Ariz.

*Montezumia arizonensis* Bequaert, 1940. Ent. Soc. Amer., Ann. 33: 96. ♀.

## Genus PACHODYNERUS Saussure

*Pachodynerus* Saussure, 1870. Rev. Mag. Zool. (2) 22: 56. Proposed originally as a division of *Odynerus* subg. *Leionotus* Sauss.; validated by Op. 893, Internatl. Comn. Zool. Nomencl., 1970.

Type-species: *Odynerus* (*Odynerus*) *californicus* Saussure. Desig. by Bohart, 1951.

Most species nest in pre-existing cavities such as in stems, twigs, abandoned larval bagworm cases, and abandoned mud-dauber cells, but one species (perhaps erroneously) has been reported as also building mud nests attached to foliage. Caterpillars are stored as prey.

Taxonomy: van der Vecht, 1967. Bul. Zool. Nomencl. 24: 31 (request for validation of *Pachodynerus* Sauss., 1870). —Internatl. Comn. Zool. Nomencl., 1970. Bul. Zool. Nomencl. 26: 187 (validation of *Pachodynerus* Sauss., type-species *Odynerus californicus* Sauss.).

*astraeus* (Cameron). Southwestern Tex. to southern Calif.; Mexico (Baja California, Hidalgo).

Ecology: Nests in cavities in wood, *Sambucus* stems, abandoned mud-dauber cells, abandoned larval bagworm cases; it is also reported, perhaps in error, as building mud nests attached to leaves of growing plants. Parasite: *Sphaerophthalma* (*Photopsioides*) *uro* (Bl.). Prey: Caterpillars. Predator: *Macrosiagon c. cruentum* (Germ.).

*Odynerus* (*Pachodynerus*) *astraeus* Cameron, 1905. Amer. Ent. Soc. Trans. 31: 390. ♀.

*Odynerus pulverulenta* Viereck, 1908. Amer. Ent. Soc. Trans. 33: 406. ♀.

*Odynerus acuticarinatus* Cameron, 1909. Pomona Col. Jour. Ent. 1: 82. ♀.

Biology: Rau, 1940. Ent. Soc. Amer., Ann. 33: 592 (nest). —Davis, 1964. U. S. Natl. Mus., Bul. 244: 13 (nest). —Parker and Bohart, 1966. Pan-Pacific Ent. 42: 93 (nest, parasite).

—Krombein, 1967. Trap-nesting wasps and bees, pp. 85-87, pl. 24, figs. 115-118 (nest, prey, life history, predator).

*erynnis* (Lepeletier). S. C. to Fla., west to La., Mass. (rarely after storm). Ecology: Nests in pre-existing cavities such as borings in wood and abandoned cynipid galls. Parasite: *Megaselia* sp.; *Toxophora amphitea* Wlkr., *Anthrax a. argyropygus* Wied.; *Amobia erythrura* (Wulp); *Pseudoxenos erynnidis* Pierce; *Melittobia chalybii* Ashm.; *Chrysis inaequidens* Dahlb. Prey: Stenomidae spp.; Blastobasidae sp.; *Platynota* sp., Tortricidae sp.; *Psilocorsis* sp., Oecophoridae spp.; *Acrobasis* sp., *Etiella zinckenella* (Treitschke), Phycitinae spp.; Chrysaugidae sp.; *Palthis angularis* (Hbn.).

*Odynerus erynnis* Lepeletier, 1841. Hist. Nat. Ins. Hym. 2: 645. ♀.

*Odynerus* (*Odynerus*) *Erinnyis* (!) Saussure, 1875. Smithsn. Inst., Misc. Collect. 254: 245. ♂, ♀. Emend.

*Odynerus errings* (!) Isely, 1914. Kans. Univ. Sci. Bul. (2) 8: 240.

Biology: Ashmead, 1894. Psyche 7: 76-78 (nest). —Krombein, 1967. Trap-nesting wasps and bees, pp. 87-90 (nest, prey, life history, associates).

*nasidens* (Latreille). Southern Ariz., Tex. (Brownsville), Fla. (Plantation Key); Mexico, Central America, Antilles; adventive in Hawaii, Micronesia. Ecology: Nests in abandoned mud-dauber cells and makes mud cells behind wooden siding of buildings. Parasite: *Chrysis* sp.; *Melittobia chalybii* Ashm.; *Amobia floridensis* (Tns.). Prey: Epipaschiidae sp. Predator: *Crematogaster* spp.; *Macrosiagon* sp.

*Odynerus nasidens* Latreille, 1812. In Humboldt and Bonpland, Voy. aux Reg. Equinox, Zool., v. 2, p. 112. ♀.

*Odynerus* (*Odynerus*) *auratus* Saussure, 1858. Rev. Mag. Zool. (2) 10: 166.

*Odynerus nasidens* var. *minor* Saussure, 1875. Smithsn. Inst., Misc. Collect. 254: 233. ♂, ♀.

*Odynerus clavilineatus* Cameron, 1912. Timehri 2: 222. ♀, (♂ misdet.).

*Odynerus clavilineatus* (!) Bohart, 1951. U. S. Dept. Agr., Monog. 2: 892.

Biology: Dow, 1932. Psyche 39: 12 (nest). —Rau, 1933. Jungle bees and wasps of Barro Colorado Island, pp. 169-170 (nest, prey, parasite). —Freeman and Jayasingh, 1975. Oikos 26: 86-91, 1 fig., 4 tabs. (population dynamics, parasites, predators).

## Genus PSEUDODYNERUS Saussure

*Pseudodynerus* Saussure, 1855. Etudes sur la famille des Vespides, v. 3, p. 220. Proposed originally as a division of *Odynerus* subg. *Ancistracerus* Wesmael; validated by Op. 893, Internatl. Comn. Zool. Nomencl., 1970.

Type-species: *Odynerus luctuosus* Saussure. Monotypic.

This is a primarily Neotropical genus of eumenid wasps, only one species being known from North America.

Revision: Bequaert, 1941. Amer. Mus. Novitates 1106: 1-10 (New World spp.).

Taxonomy: van der Vecht, 1967. Bul. Zool. Nomencl. 24: 31 (request for validation of *Pseudodynerus* Sauss., 1855). — Internatl. Comn. Zool. Nomencl., 1970. Bul. Zool. Nomencl. 26: 187 (validation of *Pseudodynerus* Sauss., type-species *Odynerus luctuosus* Sauss.).

**quadrisectus** (Say). N. J. to Fla., west to Ill., Kans., Okla., Tex., Colo. Ecology: Nests in cavities in wood and makes cell partitions of mud. Prey: Caterpillars.

*Odynerus quadrisectus* Harris, 1833. In Hitchcock, Rpt. Geol. Mineral. Bot. Zool. Mass., p. 589. Nom. nud. ascribed to Say.

*Odynerus quadrisectus* Say, 1837. Boston Jour. Nat. Hist. 1: 385. ♂, ♀.

*Odynerus bellone* Lepeletier, 1841. Hist. Nat. Ins. Hym., v. 2, p. 660. ♂, ♀.

Biology: Bequaert, 1925. Amer. Ent. Soc., Trans. 51: 78 (nest). — Rau, 1935. Brooklyn Ent. Soc., Bul. 30: 111 (nest, prey). — Krombein, 1967. Trap-nesting wasps and bees, pp. 45-46 (nest, prey, life history).

### Genus PARANORTONIA Bequaert

*Pachymenes* subg. *Paranortonia* Bequaert, 1940. Ent. Soc. Amer., Ann. 33: 100. Bertoni, 1934 (Rev. Soc. Cient. Paraguay 3: 109), proposed *Paranortonia* as a new genus. His name is invalid because he did not designate a type-species (Art. 13 (b), Internatl. Code Zool. Nomencl.).

Type-species: *Nortonia tolteca* Saussure. Orig. desig.

**symmorphus sonorensis** Bequaert. Colo., Ariz.

*Pachymenes symmorphus sonorensis* Bequaert, 1940. Ent. Soc. Amer., Ann. 33: 101. ♂, ♀.

**symmorphus symmorphus** (Saussure). U. S. west to Tex., Okla., Kans., Iowa.

*Odynerus* (*Odynerus*) *Symmorphus* Saussure, 1855. Etudes sur la famille des Vespides, v. 3, p. 246. ♂, ♀.

**symmorphus toltecus** (Saussure). Ariz., Tex.; Mexico (Sonora, Jalisco).

*Nortonia Tolteca* Saussure, 1875. Smithsn. Inst., Misc. Collect. 254: 140. ♂, ♀.

### Genus ANCISTROCERUS Wesmael

*Ancistrocerus* Wesmael, 1836. Acad. Sci. Bruxelles, Bul. 3: 45.

Type-species: *Vespa parietum* Linnaeus. Desig. by Girard, 1879.

*Euancistrocerus* Dalla Torre, 1904. In Wytsman, Gen. Ins., fasc. 19, p. 36. N. name.

Most species of *Ancistrocerus* nest in pre-existing cavities, such as borings in twigs, stems and structural lumber, in abandoned galls, in abandoned mud-dauber cells, and in old burrows of ground-nesting wasps and bees; a few species build complete mud cells. Only lepidopterous larvae have been recorded as prey of North American species, but a European species is reported to prey upon coleopterous larvae.

Revision: Bequaert, 1944. Ent. Amer. (n. s.) 23: 225-286 (N. Amer. spp.).

**adiabatus adiabatus** (Saussure). Transcontinental and widespread in southern Canada and U.

S. Ecology: Nests have been reported from borings in twigs, stems and wood, galls of other insects, old mud-dauber nests, empty sawfly cocoons, and rubber tubing. Parasite: *Vespacarus tigris* Bak. and Cunn.; *Anthrax irroratus* Say; *Amobia distorta* (Allen), *A. floridensis* (Allen); *Pseudoxenos tigridis* Pierce; *Acroricinus junceus* (Cr.), *Ephialtes decumbens* (Tow.), *E. sp.*, *Calliephialtes notandus* Cr., *Argotherentes lophyri*, n. subsp.; *Melittobia chalybii* Ashm.; *Monodontomerus dentipes* (Dalm.); *Chrysis coerulans* F., *C. nitidula* F. Prey: *Psilocorsis* sp., *Oecophoridae* sp.; *Griselda radicans* Wals., *Olethreutidae* spp. *Coleotechnites* sp., *Eucordylea* sp., *Gelechiidae* spp.; *Spilonota ocellana* (D. and S.), *Acleris variana* Fern., *Tortricidae* sp.; *Coleophora fletcherella* Fern.; *Phaloniidae* sp. Predator: *Philanthus zebratus nitens* (Bks.), *P. solivagus* Say. *Odynerus* (*Ancistrocerus*) *adiabatus* Saussure, 1852. Etudes sur la famille des Vespides, v. 1, p. 122. ♂.



*Odynerus (Ancistrocerus) pertinax* Saussure, 1855. Etudes sur la famille des Vespides, v. 3, p. 216. ♂.

*Odynerus (Ancistrocerus) tigris* Saussure, 1857. Rev. Mag. Zool. (2) 9: 273. ♂, ♀.

*Odynerus (Ancistrocerus) cervus* Saussure, 1858. Rev. Mag. Zool. (2) 10: 165.

*Odynerus monteregalis* Meade-Waldo, 1914. Ann. and Mag. Nat. Hist. (8) 14: 405. N. name for *canadaensis*, a nomen nudum.

*Odynerus canadaensis* Meade-Waldo, 1914. Ann. and Mag. Nat. Hist. (8) 14: 405.

Manuscript name credited to Cameron. Preocc.

*Ancistrocerus howardi* Cameron, 1909. Pomona Col. Jour. Ent. 1: 78. ♀.

*Ancistrocerus tenuatus* Tucker, 1909. Kans. Acad. Sci., Trans. 22: 286. ♀.

Biology: Rau and Rau, 1918. Wasp Studies Afield, pp. 344-345 (nest, prey). —Champlain, 1922. Psyche 29: 99 (parasite). —Bequaert, 1925. Amer. Ent. Soc., Trans. 51: 106 (nest, parasite). —Bequaert, 1943. Ent. Amer. (n. s.) 23: 260 (nest). —Boyce, 1946 (1945). Ent. Soc. Ontario, Ann. Rpt. 76, pp. 35-37 (nest, prey, life history). —Krombein, 1954. Brooklyn Ent. Soc., Bul. 49: 2-3 (nest, prey). —Coppel, 1961. Ent. News 72: 246-248, 2 figs. (nest). —Fye, 1965. Canad. Ent. 97: 731-734 (nest, prey, life history, parasite). —Medler, 1965. Kans. Ent. Soc., Jour. 38: 314-316 (nest, prey, life history, parasite). —Krombein, 1967. Trap-nesting wasps and bees, pp. 110-115 (nest, prey, life history, parasites). —Evans, 1973. Great Basin Nat. 33: 152-153 (nest, prey, parasites).

*adiabatus albolacteus* Bequaert. Que. to B. C., Alaska, Wash., Oreg., Idaho, Mont., S. Dak., Colo., Utah. Parasite: Stylopidae sp.

*Ancistrocerus tigris albolacteus* Bequaert, 1943. Ent. Amer. (n. s.) 23: 260. ♂, ♀.

*adiabatus cytainus* (Cameron). Calif., Oreg., Nev., Colo. in Transition, Upper Sonoran and Lower Sonoran Zones. Ecology: Nests in *Sambucus* stems and old mud-dauber nests. Parasite: *Chrysis coerulans* F.

*Odynerus cytainus* Cameron, 1906. Invertebrata Pacifica 1: 149. ♀.

Taxonomy: Goodpasture, 1974. Kans. Ent. Soc., Jour. 47: 364-372, figs. 1, 9 (chromosome number).

Biology: Parker and Bohart, 1966. Pan-Pacific Ent. 42: 93 (nests, parasite).

*antilope allegrus* Bequaert. Calif., Oreg., Colo.

*Ancistrocerus antilope allegrus* Bequaert, 1943. Ent. Amer. (n. s.) 23: 276. ♂, ♀.

*antilope antilope* (Panzer). Transcontinental in southern Canada and U. S. except Fla. and Ala.; Holarctic, in the Old World throughout Europe and Siberia. Ecology: In North America it is reported to nest in borings in wood, stems of sumac and elder, and in old mud-dauber nests. Parasite: *Keenethiella trisetosa* (Coor.); *Amobia distorta* (Allen); *Melittobia chalybii* Ashm.; *Chrysis coerulans* F., *C. nitidula* F., *C. spp.* Prey: *Psilocorsis* sp., Oecophoridae sp.; *Anacamptis* (?) sp., Gelechiidae spp.; Olethreutidae sp.; *Archips cerasivorana* (Fitch), *A. fervidana* (Clem.), *A. spp.*, Tortricidae spp.; *Tetralopha* sp. Epipaschiinae sp., *Mineola indigenella* (Zell.), *Salebria subcaesiella* (Clem.), *Nephopteryx* sp., Phycitinae spp., Pyralidae spp.; *Epizeuxis aemula* Hbn., Hypeninae sp., Noctuidae spp. Only the typical subspecies of *antilope* occurs in the Old World.

*Vespa insolens* ? Harris, 1780. Expos. Engl. Ins., p. 128, pl. 37, fig. 7. Type destroyed.

*Vespa antilope* Panzer, 1798. Faunae Ins. German. h. 53, pl. IX, with letterpress. ♀. Type destroyed.

*Odynerus pictus* Curtis, 1826. Brit. Ent., v. 3, p. 137 b, no. 2.

*Odynerus (Ancistrocerus) capra* Saussure, 1857. Rev. Mag. Zool. (2) 9: 273.

*Ancistrocerus nearcticus* Cameron, 1906. Amer. Ent. Soc., Trans. 32: 332. ♂.

*Ancistrocerus lecontei* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 218. ♂, ♀.

Biology: Rau and Rau, 1918. Wasp studies afield, pp. 345-346 (nest, parasite). —Taylor, 1922. Psyche 29: 56-58 (nest, life history). —Rau, 1928. Acad. Sci. St. Louis, Trans. 25: 405.

—Buckle, 1929. Canad. Ent. 51: 265-266 (erroneous prey record). —Reinhard, 1929.

Witchery of Wasps, pp. 86-91 (nest, parasite). —Cooper, 1953. Amer. Ent. Soc., Trans. 79: 13-35 (ecology, predation, life history, parasites). —Cooper, 1955. Amer. Ent. Soc., Trans.

80: 119-174, 1 pl., 6 text figs. (relations with mite, *Keenethiella*). —Medler and Fye, 1956.

- Ent. Soc. Amer., Ann. 49: 97-102, 2 figs. (nest, prey, life history, parasites). —Fye, 1965. Canad. Ent. 97: 729-731 (nest, prey, life history, parasites; misidentified as *c. catskill* (Sauss.)). —Krombein, 1967. Trap-nesting wasps and bees, pp. 90-98, pl. 6, fig. 23 (nest, prey, life history, parasites).
- antelope navajo** Bequaert. Ariz., Calif., N. Mex., Colo., Mont. in U. Sonor. Zone. Ecology: Nests in borings in wood.
- Ancistrocerus navajo* Bequaert, 1925. Amer. Ent. Soc., Trans. 51: 92. ♂, ♀.
- Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 98-99 (nest, life history).
- antelope spenceri** Bequaert. B. C.
- Ancistrocerus antelope spenceri* Bequaert, 1943. Ent. Amer. (n. s.) 23: 277. ♂, ♀.
- bustamente bustamente** (Saussure). Western U. S. east to western Tex. and Kans., north to Colo., Utah, Oreg.; Mexico. Ecology: Frequents arid areas; nests in *Sambucus* stems.
- Odynerus* (*Ancistrocerus*) *Bustamente* Saussure, 1857. Rev. Mag. Zool. (2) 9: 272. ♀.
- Odynerus pictiventris* Cameron, 1906. Amer. Ent. Soc., Trans. 32: 331. ♀.
- Ancistrocerus neocallosus* Bequaert, 1943. Ent. Amer. (n. s.) 23: 264. ♂, ♀.
- Biology: Parker and Bohart, 1966. Pan-Pacific Ent. 42: 92 (nest).
- bustamente discopictus** Bequaert. Calif., Ariz.
- Ancistrocerus neocallosus discopictus* Bequaert, 1943. Ent. Amer. (n. s.) 23: 268. ♂, ♀.
- campestris** (Saussure). U. S. east of Rocky Mts., Ont. Ecology: Nests in borings in wood and sumac stems, and in abandoned mud-dauber nests. Parasite: *Toxophora amphitea* Wlkr.; *Amobia* (?) sp.; *Melittobia chalybii* Ashm. Prey: *Psilocorsis* sp.; *Gelechia albisparsella* (Chamb.), Gelechiidae sp. Predator: *Macrosiagon cruentum* (Germ.).
- Odynerus* (*Ancistrocerus*) *campestris* Saussure, 1852. Etudes sur la famille des Vespides, v. 1, p. 123. ♀.
- Biology: Rau and Rau, 1916. Jour. Anim. Behavior 6: 43 (nest, prey). —Snelling, 1963. Pan-Pacific Ent. 39: 88 (nest, predator). —Medler, 1966. Ent. Soc. Wash., Proc. 68: 143-144 (nest, life history, parasite). —Krombein, 1967. Trap-nesting wasps and bees, pp. 100-102 (nest, life history, parasites).
- catskill albophaleratus** (Saussure). Transcontinental in Canadian and Transition Zones in Alaska, Labrador, Canada and U. S. south to mts. of Ariz., N. Mex., N. C. Ecology: Nests in borings in wood and sumac, in hollow stems, and in deserted galls. Parasite: Stylopidae sp.; *Melittobia* sp.; *Chrysis coeruleans* F., *C. nitidula* F. Prey: Noctuidae sp.; Geometridae sp.; *Badebecia* near *urticana* Hbn., *Exartema punctanum* Wals., *Hedia ochroleucana* Hbn., *Anchylopera* sp., *Epiblema culminaria* Wals., *Gypsonoma* (?) sp., *Zeiraphera ratzeburgiana* Ratz., *Z. fortunana* Kft., *Z.* sp., *Griselda radicans* Wals., *Rhopobota naevana geminata* Steph., *Pseudexentera* sp., *Epinotia* spp., *Ptycholoma* (?) sp., *Pandemis* spp., *Choristoneura rosaceana* Harr., *C. fumiferana* (Clem.), *Argyrotaenia velutinana* (?) Wlkr., *A.* spp., *Acleris* spp., Olethreutidae spp.; *Recurvaria* spp., *Eucordylea* spp., Gelechiidae spp.; Oecophoridae spp.; *Salebria fructella* Hulst; *Pterophorus delawarensis* (Zell.). Predator: *Philaenus pulcher* D. T., *P. solivagus* Say.
- Odynerus* (*Ancistrocerus*) *Albophaleratus* Saussure, 1855. Etudes sur la famille des Vespides, v. 3, p. 217. ♂, ♀.
- Ancistrocerus quebecensis* Cameron, 1906. Amer. Ent. Soc., Trans. 32: 333. ♂.
- Odynerus* (*Hypodermus* (!)) *longipilosus* Cameron, 1908. Amer. Ent. Soc. Trans. 34: 199. ♀.
- Odynerus albophaleratus* (!) Isely, 1914. Kans. Univ. Sci. Bul. (2) 8: 240.
- Biology: Packard, 1869. Guide Study Ins., pp. 155-156 (nest, prey). —Taylor, 1922. Psyche 29: 60-61 (nest, prey, life history). —Bequaert, 1925. Amer. Ent. Soc., Trans. 51: 104 (nest). —Bequaert, 1943. Ent. Amer. (n. s.) 23: 253 (nest, parasite). —Fye, 1965. Canad. Ent. 97: 723-729 (nest, prey, life history, parasites). —Krombein, 1967. Trap-nesting wasps and bees, pp. 104-110, pl. 3, fig. 11 (nest, prey, life history, parasites; a composite account based on nests of *c. albophaleratus*, *c. catskill*, and hybrids between them).
- catskill catskill** (Saussure). Southern Canada west to Alta., transcontinental in U. S. in Transition and Austral Zones. Ecology: Nests in pre-existing borings in wood, *Sambucus*, and sumac, in abandoned mud-dauber nests, and in deserted burrows of ground-nesting bees. Parasite: *Kennethiella* sp., *Vespacarus tigris* Bak. and Cunnl.;

*Toxophora virgata* O. S., *Anthrax a. argyropygus* Wied., *A. irroratus* Say; *Megaselia* sp.; *Amobia* (?) sp.; *Microdontomerus anthidii* (Ashm.); *Chrysis coerulans* F., *C. nitidula* F.; *Sphaerophthalma amphion* (Fox), *S. sp.* Prey: *Olethreutidae* sp.; *Archips* sp., *Tortricidae* sp. Predator: *Philanthus solivagus* Say.

*Odynerus* (*Ancistrocerus*) *Catskill* Saussure, 1853. Etudes sur la famille des Vespides, v. 1, p. 136. ♂, ♀.

*Odynerus* (*Ancistrocerus*) *catskillensis* Saussure, 1855. Etudes sur la famille des Vespides, v. 3, p. 204. Emend.

*Odynerus Catskilli* (!) Saussure, 1875. Smithsn. Inst., Misc. Collect. 254: 168.

*Ancistrocerus sercingulatus* Ashmead, 1901. Psyche 9: 185. ♂.

*Ancistrocerus ormsbyensis* Cameron, 1905. Invertebrata Pacifica 1: 120. ♂.

*Ancistrocerus gunnisonensis* Cameron, 1906. Invertebrata Pacifica 1: 146. ♂.

*Ancistrocerus gunnisonensis* (!) Cameron, 1908. Amer. Ent. Soc., Trans. 34: 213.

Biology: Myers, 1927. Ent. Monthly Mag. 53: 190-196 (nest, parasite). — Rau, 1935. Brooklyn Ent. Soc., Bul. 30: 111 (nest). — Rau, 1945. Ent. Soc. Amer., Ann. 38: 88 (nest). — Hobbs, Nummi, and Virotek, 1961. Canad. Ent. 93: 144 (nest). — Medler, 1964. Ent. Soc. Wash., Proc. 66: 210 (parasites). — Medler, 1966. Ent. Soc. Wash., Proc. 68: 139-142 (nest, prey, life history). — Krombein, 1967. Trap-nesting wasps and bees, pp. 104-110, pl. 3, fig. 11 (nest, prey, life history, parasites; a composite account based on nests of *c. cataskill*, and hybrids between them). — Parker and Bohart, 1968. Pan-Pacific Ent. 44: 2 (nest, parasites).

**cataskill halophila** Viereck. Rocky Mts. west to Pacific Coast. Ecology: Nests in borings in twigs and *Sambucus* stems, in old oak galls, and possibly also in abandoned burrows of ground-nesting bees. Parasite: *Chrysis derivata* Buyss.

*Ancistrocerus halophila* Viereck, 1903 (1902). Acad. Nat. Sci. Phila., Proc. 54: 735. ♂.

*Ancistrocerus trichionotus* Cameron, 1905. Invertebrata Pacifica 1: 120. ♂.

*Ancistrocerus fulvitaris* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 205. ♂, ♀.

*Ancistrocerus tahoensis* Rohwer, 1917. U. S. Natl. Mus., Proc. 53: 235. ♀.

Biology: Bequaert, 1943. Ent. Amer. (n. s.) 23: 255 (nest). — Bohart, 1951. U. S. Dept. Agr., Monog. 2: 894 (nests). — Parker and Bohart, 1966. Pan-Pacific Ent. 42: 92-93 (nests, parasite).

**durangoensis** Cameron. Western Okla. and Tex., N. Mex., Ariz., Utah, Colo., Wyo. in Upper Sonoran Zone; Mexico. Ecology: Nests in borings in wood. Parasite: *Chrysis inflata* Aar. Prey: Lepidoptera larvae.

*Ancistrocerus durangoensis* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 216. ♂.

*Ancistrocerus fulvicarpus* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 222. ♀.

Biology: Linsley, 1962. Ent. Soc. Amer., Ann. 55: 154-155, fig. 3 (sleeping aggregations). — Krombein, 1967. Trap-nesting wasps and bees, p. 102 (nest, prey, life history, parasite).

**lineiventris kamloopsensis** Bequaert. B. C., Oreg., Wyo.

*Ancistrocerus lineiventris kamloopsensis* Bequaert, 1943. Ent. Amer. (n. s.) 23: 280. ♂, ♀.

**lineiventris lineiventris** Cameron. West. U. S. east to S. Dak., west. Kans. mostly in Transition Zone. Ecology: Nests in *Sambucus* stems. Parasite: *Amobia floridensis* (Tns.), *Pimpla spatulata* Tow.; *Chrysis inflata* Aar.

*Ancistrocerus lineiventris* Cameron, 1906. Invertebrata Pacifica 1: 146. ♂.

Biology: Parker and Bohart, 1966. Pan-Pacific Ent. 42: 93 (nest, parasites).

**lineiventris sinopsis** Bohart. Colo., west. Tex., Utah, Ariz.

*Ancistrocerus lineiventris sinopsis* Bohart, 1974. Kans. Ent. Soc., Jour. 47: 466. ♂, ♀.

**lutonidus** Bohart. Mass. to S. C., Ind., Wis., Tex. Ecology: Nests are made of hardened clay, are attached to twigs of low bushes, and contain 6-20 or more cells arranged somewhat radially.

*Ancistrocerus lutonidus* Bohart, 1974. Kans. Ent. Soc., Jour. 47: 465. ♂, ♀.

Biology: Packard, 1869. Guide Study Ins., p. 156, pl. 5, fig. 12 (nest). — Riley, 1880. Amer. Ent. 3: 154. — Strand, 1914. Ent. Mitt. 3: 116-118. — Viereck, 1916. Conn. State Geol. and

Nat. Hist. Survey, Bul. 22, pl. 4, fig. 1 (nest). Misdet. as *birenimaculatus* (Sauss.) in preceding references.

**paracallosus** Bequaert. S. Dak., Ariz.

*Ancistrocerus paracallosus* Bequaert, 1943. Ent. Amer. (n. s.) 23: 269. ♂, ♀.

**parietum** (Linnaeus). Que., Ont., Mass. and R. I. south to D. C., Ohio, Mich.; Palaearctic in Europe and North Africa east to Manchuria, also in the Azores and Madeira. Ecology: Nests in crevices in mortar and glass tubing in North America; in Europe is reported to nest in tree stumps, rock crevices, and in burrows in clay banks. Adventive from Europe. Parasite: Stylopidae sp. Prey: Tortricidae sp. in Ont.; in Europe the usual prey is caterpillars, but there is one record of storing coleopterous larvae, *Melasoma populi* L.

*Vespa parietum* Linnaeus, 1758. Syst. Nat., ed. 10, v. 1, p. 572.

*Odynerus ? geoffroyanus* Spinola, 1808. Insectorum Liguria 2: 182.

*Odynerus flavipes* Curtis, 1826. Brit. Ent. 3: 137 b, no. 12.

*Odynerus* (*Ancistrocerus*) *Ochlerus* Saussure, 1852. Etudes sur la famille des Vespides, v. 1, p. 131. ♀.

*Odynerus parietum* var. *incisoides* Verhoeff, 1890. Ent. Nachr. 16: 335. Type probably destroyed.

*Odynerus parietum* var. *incisus* Verhoeff, 1890. Ent. Nachr. 16: 335. Type destroyed.

*Odynerus parietum* var. *parietoides* Verhoeff, 1890. Ent. Nachr. 16: 335. Type destroyed.

*Ancistrocerus tardinotus* Taylor, 1922. Psyche 29: 49. A manuscript name attributed to Bequaert and validated under the provisions of Art. 12 and Art. 16 (a) (viii) of the Code.

Biology: Taylor, 1922. Psyche 29: 49-55 (nest, prey, life history). — Miller, 1954. Canad. Ent. 86: 197-198, 4 figs. (nest, prey). The foregoing references are to the north American population; biological references to the Palaearctic population are to be found in the Palaearctic eumenid catalog by van der Vecht and Fischer, 1972.

**parredes** (Saussure). Ariz. (Huachuca Mts.); Mexico, Central America to Panama.

*Odynerus* (*Ancistrocerus*) *Parredes* Saussure, 1857. Rev. Mag. Zool. (2) 9: 273. ♀.

*Odynerus Parredesi* (!) Saussure, 1875. Smithsn. Inst., Misc. Collect. 254: 180. ♀. Emend.

**simulator** Cameron. Nev., Calif. Ecology: Nests in old *Sceliphron* nests.

*Ancistrocerus simulator* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 222. ♀.

Taxonomy: Goodpasture, 1974. Kans. Ent. Soc., Jour. 47: 364-372, figs. 4, 9 (chromosome number).

Biology: Goodpasture, 1974. Kans. Ent. Soc., Jour. 47: 365 (nest).

**spilogaster** Cameron. West. U. S. east to Mont., Wyo., Utah, northern Ariz. in Upper Sonoran and Transition Zones. Ecology: Nests in twigs and *Sambucus* stems, in old oak galls, and also makes complete mud cells on rocks. Parasite: *Aritranis notata sierrae* Tow.; *Chrysis coerulans* F., *C. pattoni* Aar.

*Ancistrocerus spilogaster* Cameron, 1905. Invertebrata Pacifica 1: 121. ♂.

*Odynerus edwardsii* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 207. ♀.

Taxonomy: Goodpasture, 1974. Kans. Ent. Soc., Jour. 47: 364-372, figs. 2, 3, 9 (chromosome number).

Biology: Bequaert, 1943. Ent. Amer. (n. s.) 23: 248 (nest). — Parker and Bohart, 1966.

Pan-Pacific Ent. 42: 93 (nests, parasites).

**spinolae** (Saussure). Conn. to Fla. west to Mich., Ill., Mo. and Tex. Ecology: Nests in borings in wood and in abandoned mud-dauber nests. Parasite: *Anthrax aterrimus* (Big.); *Miltogrammini* sp.; *Kennethiella trisetosa* (Coor.). Prey: Lepidoptera larvae.

*Odynerus* (*Ancistrocerus*) *spinolae* Saussure, 1855. Etudes sur la famille des Vespides, v. 3, p. 216. ♀.

Biology: Rau, 1946. Brooklyn Ent. Soc., Bul. 41: 10-11 (nest). — Krombein, 1967. Trap-nesting wasps and bees, pp. 99-100 (nest, prey, life history, parasites).

**tuberculocephalus sutterianus** (Saussure). Calif., Nev., Utah, Oreg., B. C. in Upper Sonoran and Transition Zones. Ecology: Nests in old mud-dauber nests. Parasite: *Chrysis coerulans* F., *C. inflata* Aar.

*Odynerus* (*Ancistrocerus*) *Sutterianus* Saussure, 1875. Smithsn. Inst., Misc. Collect. 254: 186. ♂, ♀.

*Ancistrocerus sutteranus* (!) Cameron, 1905. Invertebrata Pacifica 1: 123.

Taxonomy: Goodpasture, 1974. Kans. Ent. Soc., Jour. 47: 364-372, figs. 5, 6, 9 (chromosome number).

Biology: Bequaert, 1943. Ent. Amer. (n. s.) 23: 285 (nest).

**tuberculocephalus tuberculocephalus** (Saussure). S. Dak., Wyo., Utah, Colo., Ariz., N. Mex., western Tex.; Mexico in temperate regions south to Federal District. Ecology: Nests in borings in wood and *Sambucus*, and in abandoned mud-dauber nests. Parasite:

Bombyliidae sp.; *Chrysis inflata* Aar. Prey: Gelechiidae sp. Predator: Cleridae sp., larva.

*Odynerus* (*Ancistrocerus*) *tuberculocephalus* Saussure, 1852. Etudes sur la famille des Vespides, v. 1, p. 122. ♂, ♀.

*Odynerus tuberculiceps* Saussure, 1853. Etudes sur la famille des Vespides, v. 1, (errata). Emend.

Biology: Rau, 1940. Ent. Soc. Amer., Ann. 33: 593 (nest). —Krombein, 1967. Trap-nesting wasps and bees, pp. 102-104 (nest, prey, life history, associates). —Parker and Bohart, 1968. Pan-Pacific Ent. 44: 2 (nest).

**unifasciatus seminole** Bequaert. Fla.

*Ancistrocerus unifasciatus seminole* Bequaert, 1943. Ent. Amer. (n. s.) 23: 282. ♀.

**unifasciatus unifasciatus** (Saussure). Southern Canada and eastern U. S. west to Ont., Mich., Iowa, Kans. and Tex. Ecology: Nests in abandoned mud-dauber nests.

*Odynerus* (*Ancistrocerus*) *unifasciatus* Saussure, 1852. Etudes sur la famille des Vespides, v. 1, p. 121. ♀.

Biology: Rau and Rau, 1913. Ent. News 24: 396-397 (nest).

**waldenii excavatus** Bequaert. B. C., Wash., Oreg., Calif., Mont., Wyo., Colo., Ariz. Ecology: Builds mud nests on rocks.

*Ancistrocerus waldenii excavatus* Bequaert, 1943. Ent. Amer. (n. s.) 23: 244. ♂, ♀.

Biology: Bequaert, 1943. Ent. Amer. (n. s.) 23: 246 (nest).

**waldenii flavidulus** Bequaert. Oreg., Calif. Ecology: Builds mud nests on rocks. Prey: Larvae of *Cnephasia longana* (Haw.), *Archips argyrosipilus* Wlkr.

*Ancistrocerus waldenii flavidulus* Bequaert, 1943. Ent. Amer. (n. s.) 23: 246. ♂, ♀.

Biology: Bequaert, 1943. Ent. Amer. (n. s.) 23: 247 (nest). —Richards, 1962. Pan-Pacific Ent. 38: 145-146 (prey).

**waldenii waldenii** (Viereck). Alaska, Canada and U. S. south to Idaho, Wyo., N. Mex. (high mountains), Colo., S. Dak., Ill., Mich., Va. Ecology: Builds free mud nests on walls or rocks, or in cavities in mortar.

*Odynerus waldenii* (!) Viereck, 1906. Ent. News 17: 304. ♀.

*Odynerus waldenii* Viereck, 1906. Ent. News 17: 350. Emend.

Biology: Bequaert, 1943. Ent. Amer. (n. s.) 23: 243 (nest). —Morris, 1959. Canad. Ent. 91: 500 (nest).

## Genus SYMMORPHUS Wesmael

### Genus SYMMORPHUS Subgenus SYMMORPHUS Wesmael

*Symmorphus* Wesmael, 1836. Acad. Sci. Belg., Bul. 3: 45.

Type-species: *Vespa elegans* Wesmael. Desig. by Richards, 1935.

*Odynerus* subg. *Protodynerus* Saussure, 1855. Etudes sur la famille des Vespides, v. 3, p. 186. N. name for *Symmorphus*.

Only the typical subgenus occurs in North America. So far as is known, the American species nest in pre-existing cavities in twigs, stems, logs and structural lumber; a few European species are also known to nest in abandoned burrows of other wasps or bees in banks or mud walls. Partitions between cells are made of mud. Probably most of the North American species prey upon externally feeding chrysomelid larvae, but *canadensis* (Sauss.) is unique in that it preys upon leaf-mining coleopterous and lepidopterous larvae.

Revision: Saussure, 1875. Smithsn. Inst., Misc. Collect. 254: 151-157.

- Taxonomy: van der Vecht, 1966. Ent. Ber. 26: 163 (discussion of type-species designation).
- albomarginatus** (Saussure). Que., Conn., N. Y., Md., Mich., Wis., Wyo., Alta., B. C., Alaska. Ecology: Nests in borings in wood and sumac stems. Parasite: *Chrysis coerulans* F.; *Melittobia chalybii* Ashm.; *Amobia distorta* (Allen). Prey: *Chrysomela* spp., larvae. *Odynerus* (*Protodynerus*) *albomarginatus* Saussure, 1855. Etudes sur la famille des Vespides, v. 3, p. 195. ♀.
- Biology: Medler, 1966. Ent. Soc. Wash., Proc. 68: 144-145 (nest, prey, life history). —Krombein, 1967. Trap-nesting wasps and bees, pp. 120-122 (nest, prey, life history, associates).
- canadensis** (Saussure). Transcont. in Canada and U. S. (not known from Fla., Tex., N. Mex., Ariz.). Ecology: Nests in borings in wood, twigs, logs, structural lumber. Parasite: *Chrysis cembraicola* Krom.; *Melittobia chalybii* Ashm.; *Monodontomerus* sp.; *Pyemotes ventricosus* (Newp.). Prey: *Chalepus dorsalis* Thunb.; *Prionomerus calceatus* (Say), *Apion* sp.; *Antispila nyssaefoliella* Clem.; *Lithocolletis ostensackenella* (Fitch), *L.* sp., *Paractopa robinella* Clem., *Gracilariidae* sp.; *Aeaea ostryaeella* (Chamb.). Predator: *Trogoderma ornatum* Say; *Philanthus pulcher* D. T.
- Odynerus* (*Protodynerus*) *canadensis* Saussure, 1855. Etudes sur la famille des Vespides, v. 3, p. 196. ♀.
- Odynerus* (*Symmorphus*) *debilis* Saussure, 1870. Rev. Mag. Zool. (2) 22: 55. ♀.
- Symmorphus cogitans* Cameron, 1906. Amer. Ent. Soc., Trans. 32: 325. ♀.
- Biology: Reinhard, 1929. Witchery of Wasps, pp. 72-83 (nest, prey, life history, parasite). —Krombein, 1952. Amer. Ent. Soc., Trans. 78: 91 (nest, prey). —Krombein, 1954. Brooklyn Ent. Soc., Bul. 49: 3 (nest, prey). —Krombein, 1956. Ent. Soc. Wash., Proc. 58: 155 (provisioning flights, prey). —Weaver and Dorsey, 1965. Ent. Soc. Amer., Ann. 58: 933-934 (prey). —Krombein, 1967. Trap-nesting wasps and bees, pp. 115-120, pl. 4, figs. 14, 15, pl. 5, figs. 16-18, pl. 6, fig. 19 (nest, prey, life history, associates).
- cristatus cristatus** (Saussure). Canada and north. U. S. south to Md., Ill. and mountains of Colo., Utah, Ariz., Calif. Ecology: Nests in borings in wood and sumac. Parasite: *Chrysis coerulans* F., *C. nitidula* F.; *Anthrax irroratus* Say; *Amobia distorta* (Allen). Prey: *Chrysomela crotchii* Brown, *C. scripta* (F.) complex, *C. spp.*, *Chrysomelinae* sp., *Gonioctenus americanus* Brown.
- Odynerus* (*Protodynerus*) *cristatus* Saussure, 1855. Etudes sur la famille des Vespides, v. 3, p. 196. ♀.
- Odynerus* (*Protodynerus*) *Philadelphiae* Saussure, 1857. Rev. Mag. Zool. (2) 9: 272. ♀.
- Symmorphus hornii* Cameron, 1909. Pomona Col. Jour. Ent. 1: 123. ♀.
- Biology: Fye, 1965. Canad. Ent. 97: 734-735 (nest, life history, prey, parasite; note data corrections for Fye in Krombein, 1967). —Krombein, 1967. Trap-nesting wasps and bees, pp. 122-126, pl. 6, figs. 20-22 (nest, prey, life history, parasites). —Evans, 1973. Great Basin Nat. 33: 151-152 (nest, prey, parasites).
- cristatus nevadaensis** (Cameron). Wash., Oreg., Nev., Calif. Ecology: Nests in *Sambucus* stems. Parasite: *Chrysis derivata* Buyss.
- Nortonia nevadaensis* Cameron, 1905. Invertebrata Pacifica 1: 124. ♂.
- Biology: Parker and Bohart, 1966. Pan-Pacific Ent. 42: 94 (nest, parasite).
- meridionalis** Viereck. B. C., Oreg., Calif., Utah, Colo., Nebr., Wyo., N. Mex. Ecology: Nests in *Sambucus* stems. Predator: *Philanthus zebratus nitens* (Bks.).
- Symmorphus meridionalis* Viereck, 1903. Amer. Ent. Soc., Trans. 29: 69. ♂.
- Symmorphus trisulcatus* Cameron, 1906. Amer. Ent. Soc., Trans. 32: 327. ♂.
- Biology: Parker and Bohart, 1966. Pan-Pacific Ent. 42: 94 (nest).
- projectus** Bohart. Calif. (sea level to 10,000 feet), Oreg., Wash., Idaho, Wyo., Mont., Ariz. Ecology: Nests in *Sambucus* stems.
- Symmorphus projectus* Bohart, 1950. Biol. Soc. Wash. Proc. 63: 81. ♂, ♀.
- Biology: Parker and Bohart, 1966. Pan-Pacific Ent. 42: 94 (nest).
- walshianus** (Saussure). U. S. west to Tex., Iowa.
- Odynerus* (*Symmorphus*) *Walshianus* Saussure, 1870. Rev. Mag. Zool. (2) 22: 55. ♀.

## Genus EUMENES Latreille

## Genus EUMENES Subgenus EUMENES Latreille

*Eumenes* Latreille, 1802. Hist. Nat. Crust. Ins., v. 3, p. 360.

Type-species: *Vespa coarctata* Linnaeus. Desig. by Latreille, 1810.

*Alpha* Saussure, 1855. Etudes sur la famille des Vespides, v. 3, p. 128.

Type-species: *Vespa coarctata* Linnaeus. Desig. by Bequaert, 1926.

*Eumenes* Kriechbaumer, 1879. Ent. Nachr. 5: 57. Emend.

*Eumenidion* Schulthess, 1913. Soc. Ent. 28: 2.

Type-species: *Vespa coarctata* Linnaeus. Orig. desig.

Only the typical subgenus occurs in America north of Mexico.

So far as is known, all species make juglike mud nests, which are usually attached to twigs and are provisioned with caterpillars.

Revision: Isely, 1917. Ent. Soc. Amer., Ann. 10: 345-363 (N. Amer. spp.). —Bequaert, 1938.

Brooklyn Ent. Soc., Bul. 33: 59-70 (spp. northeastern U. S. and eastern Canada).

—Bequaert, 1944. Nat. Canad. 71: 75-88 (Canad. spp.).

**areus** Isely. Okla., western Tex. to southern Calif.; Mexico (Baja California).

*Eumenes belfragei areus* Isely, 1917. Ent. Soc. Amer., Ann. 10: 352. ♀.

Biology: Linsley, 1962. Ent. Soc. Amer., Ann. 55: 152-153, figs. 1, 2 (sleeping habits).

**bollii bollii** Cresson. Western half of U. S. north to Nebr., Colo., Utah, Nev., Calif., Alta., Mo., Iowa, Minn.; Mexico (Baja California).

*Eumenes bollii* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 232. ♂, ♀.

Biology: Isely, 1914. Kans. Univ. Sci. Bul. (2) 8: 299-301 (nest).

**bollii oregonensis** Bequaert. Wash., Oreg., Idaho, Nev.

*Eumenes bollii* var. *oregonensis* Bequaert, 1938. Brooklyn Ent. Soc., Bul. 33: 66. ♀.

**crucifera bolliformis** Viereck. Ariz., N. Mex.; Mexico.

*Eumenes (Pachymenes) bolliformis* Viereck, 1908. Amer. Ent. Soc., Trans. 33: 387. ♂, ♀.

*Eumenes robustus* Isely, 1917. Ent. Soc. Amer., Ann. 10: 360. ♀.

Biology: Linsley, 1962. Ent. Soc. Amer., Ann. 55: 153 (sleeping habits).

**crucifera crucifera** Provancher. Western U. S. east to Colo., S. Dak. and north to Wyo., B. C., Alta.

*Eumenes crucifera* Provancher, 1888. Addit. Corr. Faune Ent. Canada Hym., p. 421. ♀.

*Eumenes (Alpha) marginilineatus* Viereck, 1907. Amer. Ent. Soc., Trans. 33: 381. ♂.

*Eumenes emarginilineatus* (!) Viereck, 1907. Amer. Ent. Soc., Trans. 33: 388.

*Eumenes sternalis* Isely, 1917. Ent. Soc. Amer., Ann. 10: 353. ♂.

*Eumenes xanthogaster* Isely, 1917. Ent. Soc. Amer., Ann. 10: 353. ♂.

**crucifera flavitinctus** Bohart. Calif.

*Eumenes crucifera flavitinctus* Bohart, 1950. Biol. Soc. Wash., Proc. 63: 79. ♂, ♀.

**crucifera nearticus** Bequaert. Transcontinental north to 63 degrees N. Latitude, south to Oreg., Utah, Colo., Ky., N. J.

*Eumenes minuta* Saussure, 1852. Etudes sur la famille des Vespides, v. 1, p. 39. ♂. Preocc.

*Eumenes (Alpha) Globulosus* Saussure, 1855. Etudes sur la famille des Vespides, v. 3, p. 139. ♀. Preocc.

*Eumenes nearticus* Bequaert, 1944. Nat. Canad. 71: 82. ♂. ♀. N. name for *globulosus*.

**crucifera stricklandi** Bequaert. Alta. (Cypress Hills).

*Eumenes coloradensis stricklandi* Bequaert, 1944. Nat. Canad. 71: 84. ♀.

**fraternus** Say. Ont., U. S. west to Tex., Okla., Kans., Nebr., Minn. Parasite: *Chrysis conica* Br.; *Timulla ferrugata* (F.).

*Eumenes fraterna* Say, 1824. In Keating, Narr. Long's 2nd Exped., v. 2, p. 344.

*Eumenes Fervens* Saussure, 1852. Etudes sur la famille des Vespides, v. 1, p. 40. ♂, ♀.

Biology: Isely, 1914. Kans. Univ. Sci. Bul. (2) 8: 301 (nest).

**iturbide iturbide** Saussure. Colo., N. Mex., Ariz.; Mexico.

*Eumenes (Alpha) Iturbide* Saussure, 1857. Rev. Mag. Zool. (2) 9: 271.

*Eumenes (Alpha) globulosiformis* Viereck, 1908. Amer. Ent. Soc., Trans. 33: 386. ♂, ♀.

- Biology: Linsley, 1962. Ent. Soc. Amer., Ann. 55: 153 (sleeping habits).
- iturbide pedalis** Fox. B. C., Wash., Idaho, Mont., Wyo., Colo., Utah, Calif.; Mexico (Baja California).  
*Eumenes pedalis* Fox, 1894. Calif. Acad. Sci., Proc. (2) 4: 109. ♂, ♀.  
*Eumenes crassicornis* Isely, 1917. Ent. Soc. Amer., Ann. 10: 362. ♂.  
*Eumenes pachygaster* Isely, 1917. Ent. Soc. Amer., Ann. 10: 362. ♀.
- sculleni** Bohart. Nev., Utah.  
*Eumenes sculleni* Bohart, 1950. Biol. Soc. Wash., Proc. 63: 78. ♂, ♀.
- smithii americanus** Saussure. Colo., Nebr., Kans., Mo., Ark., Okla., Tex.; Mexico (Michoacan, Guadalajara). Prey: Geometridae larvae.  
*Eumenes americanus* Saussure, 1852. Etudes sur la famille des Vespides, v. 1, p. 39. ♀.  
*Eumenes belfragei* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 232. ♂, ♀.  
*Eumenes brunneus* Isely, 1917. Ent. Soc. Amer., Ann. 10: 348. ♂. Preocc.
- Biology: Hartman, 1913. Jour. Anim. Behavior 3: 353-360, 7 figs. (nest building, prey, life history).
- smithii smithii** Saussure. N. C., Ga., Fla., Ala., Miss.  
*Eumenes Smithii* Saussure, 1852. Etudes sur la famille des Vespides, v. 1, p. 43. ♂, ♀.
- Biology: Isely, 1917. Ent. Soc. Amer., Ann. 10: 350 (nest).
- verticalis coloradensis** Cresson. Western U. S. and Canada (except Oreg., Calif.) east to Sask., S. Dak., Colo., N. Mex.; Mexico.  
*Eumenes coloradensis* Cresson, 1875. Rpt. Geog. Geol. Expl. and Survey west of 100th Meridian, v. 5, p. 717. ♂, ♀.  
*Eumenes (Alpha) cruciferorum* Viereck, 1908. Amer. Ent. Soc., Trans. 33: 388. ♂, ♀.  
*Eumenes (Alpha) enigmatus* Viereck, 1908. Amer. Ent. Soc., Trans. 33: 389. ♂.  
*Eumenes stenogaster* Isely, 1917. Ent. Soc. Amer., Ann. 10: 353. ♂, ♀.  
*Eumenes enigmaticus* (!) Bequaert, 1938. Brooklyn Ent. Soc., Bul. 33: 69.
- verticalis neoboreus** Bequaert. Que., Ont., Alta., B. C.  
*Eumenes verticalis neoboreus* Bequaert, 1944. Nat. Canad. 71: 87. ♂, ♀.
- verticalis tricornis** Isely. Alta., Idaho, Utah, Nev., Oreg., Calif., Ariz.; Mexico (Baja California).  
*Eumenes tricornis* Isely, 1917. Ent. Soc. Amer., Ann. 10: 361. ♀.
- verticalis verticalis** Say. Ont., Man., north. and east. U. S. south to N. C., Mo. and west to N. Dak., S. Dak.  
*Eumenes verticalis* Say, 1824. In Keating, Narr. Long's 2nd Exped., v. 2, p. 346.

## SUBFAMILY ZETHINAE

## TRIBE ZETHINI

There are only four genera in this tribe. *Zethus* is primarily Neotropical with a few species entering the Nearctic Region. The other genera are Australian.

## Genus ZETHUS Fabricius

The genus is primarily Neotropical in distribution, but it occurs also in the Nearctic, Oriental and Ethiopian Regions. Very little is known of the biology of the North American species. Overall, the species range from the more primitive solitary taxa which nest in abandoned borings of other insects to subsocial species in which several females build a common nest of vegetable matter and resin, and feed their larvae progressively with lepidopterous larvae.

Revision: Bohart and Stange, 1965. Univ. Calif., Pubs. Ent. 40: 1-208, 354 figs. (New World spp.).

Taxonomy: Porter, 1975. Fla. Ent. 58: 303-306, 5 figs. (key to U. S. spp.).

## Genus ZETHUS Subgenus ZETHUS Fabricius

*Zethus* Fabricius, 1804. Systema Piezatorum, pp. xii, 282.

Type-species: *Vespa coeruleopennis* Fabricius. Desig. by Ashmead, 1902.



*Didymogastra* Perty, 1833. Delect. anim. artic. Brasil, p. 145.

Type-species: *Didymogaster fusca* Perty. Desig. by Ashmead, 1902.

*Lethus* (!) Say, 1836. Boston Jour. Nat. Hist. 1: 209. Misspelling.

*Heros* Saussure, 1855. Etudes sur la famille des Vespides, v. 3, p. 115.

Type-species: *Zethus gigas* Spinola. Monotypic.

*Wettsteinia* Dalla Torre, 1904. In Wytsman, Gen. Ins., fasc. 19, p. 13.

Type-species: *Labus sichelianus* Saussure. Desig. by Bohart and Stange, 1965.

*Euzethus* Dalla Torre, 1904. In Wytsman, Gen. Ins., fasc. 19, p. 14. N. name.

*Laboides* Zavattari, 1912. Arch. f. Naturgesch. 78, Abt. A, H. 4: 65.

Type-species: *Labus sichelianus* Saussure. Desig. by Bohart and Stange, 1965.

**miscogaster** Saussure. Tex. (Hidalgo Co.), Ariz. (Baboquivari Mts.); Mexico to Argentina.

*Zethus Miscogaster* Saussure, 1852. Etudes sur la famille des Vespides, v. 1, p. 18. ♀.

*Zethus Zendalus* Saussure, 1875. Smithsn. Inst., Misc. Collect. 254: 53. ♀.

*Zethus emarginatus* Fox, 1899. Acad. Nat. Sci. Phila., Proc., p. 429. ♀.

*Zethus claripennis* Cameron, 1907. Entomologist 40: 63. ♂.

*Zethus punctinodis* Cameron, 1907. Entomologist 40: 79. ♀.

*Didymogastra brethesi* Zavattari, 1911. Zool. Jahrb. 31: 42. ♀.

*Zethus pavidus* Zavattari, 1912. Arch. f. Naturgesch. 78, Abt. A, 4: 72. ♀.

*Zethus binghami* Zavattari, 1913. Arch. f. Naturgesch. 79, Abt. A, 1: 114. ♂.

**montezuma** Saussure. Tex. (Hidalgo Co.) south to Colombia.

*Zethus montezuma* Saussure, 1857. Rev. Zool. (2) 9: 270. ♀.

**spinipes spinipes** Say. Mass. to N. C. west to Ill., Kans., Ark.

*Lethus* (!) *spinipes* Say, 1837. Boston Jour. Nat. Hist. 1: 387. ♀.

*Eumenes substricta* Haldeman, 1844. Acad. Nat. Sci. Phila., Proc. 2: 54.

*Eumenes pensilvanica* Haldeman, 1853. Acad. Nat. Sci. Phila., Proc. 6: 365.

*Zethus pensilvanica* Saussure, 1875. Smithsn. Inst., Misc. Collect. 254: 29. Emend.

*Zethus Pennsylvanica* Dalla Torre, 1894. Cat. Hym., v. 9, p. 14. Emend.

**spinipes variegatus** Saussure. Md. to Fla., Ala., La., Tex., Okla. Prey: *Rhyacionia frustrana* (Comst.).

*Zethus variegatus* Saussure, 1852. Etudes sur la famille des Vespides, v. 1, p. 13. ♀.

*Zethus bicolor* Saussure, 1852. Etudes sur la famille des Vespides, v. 1, p. 17. ♂.

Biology: Lashomb and Steinhauer, 1975. Ent. Soc. Wash., Proc. 77: 164 (prey capture).

### Genus ZETHUS Subgenus ZETHUSCULUS Saussure

*Zethusculus* Saussure, 1855. Etudes sur la famille des Vespides, v. 3, p. 118.

Type-species: *Zethus jurinei* Saussure. Desig. by Ashmead, 1902.

**slossonae** Fox. Southern Fla. Ecology: Nests in twigs.

*Zethus slossonae* Fox, 1892. Ent. News 2: 29. ♂, ♀.

Biology: Bohart and Stange, 1965. Univ. Calif., Pubs. Ent. 40: 16 (nest).

### Genus ZETHUS Subgenus ZETHOIDES Fox

*Zethoides* Fox, 1899. Acad. Nat. Sci. Phila., Proc., p. 436.

Type-species: *Zethoides smithii* Fox. Monotypic.

*Baeoprymna* Cameron, 1912. Timehri 2: 225.

Type-species: *Baeoprymna rufoornata* Cameron. Monotypic.

*Protozethus* Bertoni, 1925. Soc. Cient. Paraguay, Rev. 2: 75.

Type-species: *Zethus olmecus* Saussure. Orig. desig.

**aztecus** Saussure. Tex. (Hidalgo Co.) south to Guatemala and El Salvador.

*Zethus aztecus* Saussure, 1857. Rev. Zool. (2) 9: 270. ♂.

*Zethus campestris* Zavattari, 1913. Arch. f. Naturgesch. 79, Abt. A, h 1: 108. ♀.

**guerreroi arizonensis** Bohart. Ariz., N. Mex.; Mexico (Sonora, Sinaloa). Typical *guerreroi* Zavattari occurs in Mexico and El Salvador.

*Zethus (Zethusculus) arizonensis* Bohart, 1950. Biol. Soc. Wash., Proc. 63: 77. ♂, ♀.

### UNPLACED TAXA OF EUMENIDAE

*Odynerus bimaculatus* Provancher, 1895. Nat. Canad. 22: 157. ♀. Type in Laval Univ., Que.

- Odynerus bisstrigatus* Spinola, 1808. Insectorum Liguria, v. 1, p. 180. Amer. sept. Described originally as *bis-strigatus*; location of type unknown.
- Odynerus* (?) *bradleyi* Cameron, 1909. Pomona Col. Jour. Ent. 1: 81 ♀. Colo. (Durango). Type depository unknown.
- Odynerus crotchii* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 197. ♂, ♀. Tex. (Lee Co.). Lectotype in British Museum (Nat. Hist.); possibly a *Leptochilus*.
- Odynerus* (*Odynerus*) *nortonianus* Saussure, 1870. Rev. Mag. Zool. (2) 22: 105. ♀. Conn.
- Odynerus pulchrinervis* Cameron, 1906. Amer. Ent. Soc., Trans. 32: 328. ♀. N. Mex. Type depository unknown, the type probably lost.
- Odynerus robustus* Provancher, 1895. Nat. Canad. 22: 157. ♀. Calif. (Los Angeles). Type in Laval Univ., Que.
- Odynerus scudderi* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 196. ♀. Southwest. U. S. Type depository unknown, the type probably lost.
- Odynerus pulchricolor* Provancher, 1895. Nat. Canad. 22: 158. ♂. Calif. (Los Angeles). Type in Laval Univ., Que.

## NOMINA NUDA IN EUMENIDAE

- Ancistrocerus behrensi* Tucker, 1909. Kans. Acad. Sci., Trans. 22: 286.
- Leionotus scrophulariae* Robertson, 1928. Flowers and Insects, p. 11.
- Leionotus ziziae* Robertson, 1928. Flowers and Insects, p. 12.
- Odynerus daedalus* Harris, 1835. In Hitchcock, Rpt. Geol. Mineral. Bot. Zool. Mass., p. 589.

## Family VESPIDAE

The wasps belonging to this family are all social species, the colonies consisting of one or more fertile queens, workers which are frequently numerous and usually infertile, and, at times, males and new queens.

Taxonomy: Lewis, 1897. Amer. Ent. Soc., Trans. 24: 169-192, 1 pl. (N. Amer. spp.) — Bohart and Bechtel, 1957. Calif. Ins. Survey, Bul. 4: 73-102, 8 pls., 34 figs., 7 maps (Calif. spp.).

Biology: Rau, 1929. Canad. Ent. 61: 219-221 (cocoon spinning). — Jeanne, 1975. Quart. Rev. Biol. 50: 267-287, 9 figs. (adaptiveness of nest architecture).

Morphology: van der Vecht, 1968. K. Nederland. Akad. van Wetensch., Proc., Ser. C, 71: 411-422, 5 figs. (terminal gastral sternite, female, worker).

## SUBFAMILY POLISTINAE

These are commonly called paper wasps in North America. The nests consist of a single comb which is not enclosed in a paper envelope. In most of the Temperate Zone species the nests are annual, each being founded by one or more overwintering females. One of the females becomes dominant and is the only one to lay eggs.

The normal larval food consists of dismembered caterpillars. Some species of *Polistes* exert considerable predator pressure on economically important insects such as the tobacco hornworm and cotton bollworm. In an attempt to utilize the wasps as a biological control agent, shelters are sometimes placed in cultivated fields to afford nesting sites to founding females.

Taxonomy: Yoshikawa, 1962. Jour. Biol. 13: 19-43, 1 map (list of world spp., distribution).

Biology: Yoshikawa, 1962. Jour. Biol. 13: 45-64 (evolution of sociality).

## Genus POLISTES Latreille

*Polistes* Latreille, 1802. Hist. Nat. Crust. Ins., v. 3, p. 363.

Type-species: *Vespa gallica* Linnaeus. Desig. by Blanchard, 1840.

Richard's (1973) reclassification of the subgenera of *Polistes*, listed below in Taxonomy, was received too late to assign the North American species to subgenera in the format used elsewhere in the catalog for subgenera. Our species are assigned to the following subgenera.

*Polistes* subg. *Fuscopolistes* Richards, 1973, pp. 95, 100 (type-species, *Vespa fuscata*

Fabricius, orig. desig.)-- *apachus*, *bellicosus*, *carolina*, *dorsalis*, *flavus*, *fuscatus*, *metricus* and *perplexus*.

*Polistes* subg. *Polisotius* Richards, 1973, pp. 95, 100 (type-species, *Polistes major* Beauvois, orig. desig.)--*major*.

*Polistes* subg. *Onerarius* Richards, 1973, pp. 94, 101 (type-species, *Vespa carnifex* Fabricius, orig. desig.)--*carnifex*.

*Polistes* subg. *Polistarchus* Richards, 1973, pp. 94, 101 (type-species, *Vespa canadensis* Linnaeus, orig. desig.)--*annularis*, *canadensis*, *exclamans* and *instabilis*.

*Polistes* subg. *Epicnemius* Richards, 1973, pp. 96, 102 (type-species, *Polistes bicolor* Lepeletier, orig. desig.)--*pacificus*.

The typical subgenus does not occur in North America.

In the extensive series of papers listed below, Rau consistently used two misidentifications: *pallipes* for the taxon now recognized as *metricus*, and *variatus* for the taxon now recognized as typical *fuscatus*; he also used *rubiginosus* for *carolina*, a senior synonym.

Revision: Bequaert, 1937. Arch. Inst. Biol. Veg., Rio de Janeiro 3: 171-205 (New World taxa of Gallicus and Bicolor species groups). — Bequaert, 1940. N. Y. Ent. Soc., Jour. 48: 1-31 (N. Amer. taxa). — Bequaert, 1943. Ent. Venezolana, Bol. 2: 107-124 (New World vars. of *canadensis* (L.)). — Snelling, 1955. Amer. Mus. Novitates 1701: 1-9 (subsp. of *major* Beauv. and *exclamans* Vier.).

Taxonomy: Enteman, 1904. Carnegie Inst. Wash., Pub. 19: 1-88, 6 pls., 27 figs. (coloration).

— Rau, 1942. Ent. Soc. Amer., Ann. 35: 335-338 (behavioral characters of *carolina*, *f. fuscatus*, *metricus*). — Richards, 1973. Rev. Ent. Brasil. 17: 85-103, 12 figs. (classification of subgenera). — Snelling, 1974. Ent. Soc. Wash., Proc. 76: 476-479 (status of some N. Amer. taxa).

Biology: Rau, 1928. Biol. Bul. 54: 503-519 (honey-gathering by *annularis*, *f. fuscatus*, *metricus*). — Rau, 1928. Psyche 35: 147-150, 4 figs. (modification of nests by *carolina*, *annularis*, *metricus*). — Rau, 1928. Brooklyn Ent. Soc., Bul. 23: 230-235 (hibernation, colony founding by *annularis*, *metricus*). — Duncan, 1928. Pan-Pacific Ent. 5: 90 (building material). — Rau, 1928. Psyche 35: 151-152 (reconstruction of destroyed nests by *f. fuscatus*, *metricus*). — Rau, 1929. Ecology 10: 191-200, 4 figs. (nesting habitat of *annularis*, *carolina*, *f. fuscatus*, *metricus*). — Rau, 1930. Compar. Psychol., Jour. 10: 267-286 (interspecific animosity and tolerance in workers of *f. fuscatus*, *metricus*, *annularis*). — Rau, 1930. Ent. Soc. Amer., Ann. 23: 461-466 (hibernation behavior of *carolina*, *f. fuscatus*, *metricus*, *annularis*). — Rau, 1931. Ecology 12: 690-693 (use of water by *annularis*, *metricus*, *f. fuscatus*, *carolina*). — Rau, 1931. Ent. Soc. Amer., Ann. 24: 515-518 (hibernation behavior of *annularis*, *metricus*). — Rau, 1939. Compar. Psychol., Jour. 27: 259-269 (inter- and intraspecific animosity and tolerance of female *annularis*, *f. fuscatus*, *metricus*). — Rau, 1939. Ecology 20: 439-442 (population and caste studies of *metricus*, *f. fuscatus*, *annularis*). — Rau, 1941. Ent. Soc. Amer., Ann. 34: 355-366 (parasites of *carolina*, *annularis*, *metricus*, *f. fuscatus*). — Rau, 1941. Ent. Soc. Amer., Ann. 34: 580-584 (swarming of *annularis*, *f. fuscatus*, *metricus*). — Rau, 1946. Ent. Soc. Amer., Ann. 39: 11-27 (nest and cell size of *f. fuscatus*, *metricus*). — Rabb and Lawson, 1957. Econ. Ent., Jour. 50: 778-784, 2 figs. (predation on tobacco hornworm in N. C. by *e. exclamans*, *f. fuscatus*). — Rabb, 1960. Ent. Soc. Amer., Ann. 53: 111-121 (nest founding, life history, adult and larval food, prey, foraging, parasites in N. C. in *f. fuscatus*, *annularis*, *e. exclamans*, *metricus*, *d. dorsalis*, *carolina*). — West, 1967. Science 157: 1584-1585 (female dominance hierarchies in *canadensis*, *f. fuscatus*). — Nelson, 1968. Ent. Soc. Amer., Ann. 61: 1528-1539, 3 figs. (parasites, symbionts). — Eberhard, 1969. Mich. Univ., Mus. Zool., Misc. Pub. 140: 1-101, 23 figs. (social biology of *f. fuscatus*, *canadensis*, *erythrocephalus* Latr., *e. infuscatus* Lep.). — Kirkton, 1970. Tall Timbers Conf., Proc. 2: 243-245 (population management in Ark.). — Gillaspay, 1971. Ent. Soc. Amer., Ann. 64: 1357-1361, 4 figs. (population management in Tex., Calif.). — Gillaspay, 1973. Amer. Midland Nat. 90: 1-12, 5 figs. (behavior of *metricus*, *annularis*, *major*, *bellicosus*, *exclamans*, *apachus*, *carolina* in artificial nesting sites).

*annularis* (Linnaeus). Conn. to Fla., west to S. Dak. and central Tex. Ecology: Nests suspended from twigs and branches of shrubs and trees in exposed situations, and

- occasionally in sheltered sites on buildings. Parasite: *Xenos pallidus* Brues; *Sarcophaga* sp.; *Apanteles carpatius* (Say); *Pachysomoides fulvus* (Cr.), *P. stupidus* (Cr.); *Elasmus polistis* Burks. Prey: *Halisidota tessellaris* (Sm.), *Hyphantria cunea* (Dru.); *Anisota virginensis* (Dru.), *A. senatoria* (Sm.), *A. stigma* (F.), *Citheronia regalis* (F.); Geometridae spp.; Limacodidae spp.; *Hemerocampa leucostigma* (Sm.); *Datana* spp., *Heterocampa manteo* (Dblldy.), *H. spp.*, *Nadata gibbosa* (Grt.), *Peridea angulosa* (A. and S.), *Schizura leptinoides* (Grt.), *S. spp.*; *Basilarchia* sp.; *Psilocorsis* sp.; *Acrionicta afflicta* Grt., *A. retardata* (Wlkr.), *A. spp.* *Autographa* sp., *Catocala* sp., *Heliothis zea* (Boddie), *Hyposorophia hormos* Hbn., *Phosphila turbulente* (Hbn.); *Tropaea luna* (L.); *Ampeloeca myron* (Cram.), *Cressonia juglandis* (A. and S.), *Protoparce sexta* (Johan.); prey is usually obtained in wooded areas. Predator: *Dicymolomia pegasalis* (Wlkr.), *Chalcoela iphitalis* Wlkr.
- Vespa annularis* Linnaeus, 1763. Centuria Ins. Rar., p. 30.
- Vespa cincta* Drury, 1773. Illus. Nat. Hist., Index to pt. 1 published with pt. 2.
- Biology: Fox, 1896. Ent. News 7: 57 (nest). — Brimley, 1908. Ent. News 19: 107 (male hibernation). — Rau and Rau, 1918. Wasp Studies Afield, pp. 283-290, fig. 52 (hibernation, colony founding). — Rau, 1930. Canad. Ent. 62: 81-83 (hibernation mortality). — Rau, 1930. Canad. Ent. 62: 119-120 (behavior on nest). — Rau, 1931. Brooklyn Ent. Soc., Bul. 26: 116-118, fig. 5 (nest). — Rau, 1940. Ent. Soc. Amer., Ann. 33: 617-620 (cooperative nest founding). — Rau, 1942. Ent. Soc. Amer., Ann. 35: 94-96 (temperature inducing hibernation). — Balduf, 1961. Ent. News 72: 259-260 (autumnal swarming). — Hermann and Dirks, 1974. Ga. Ent. Soc., Jour. 9: 1-8, 3 figs. (smearing on nest by sternal glands). — Hermann, Gerling and Dirks, 1974. Ga. Ent. Soc., Jour. 9: 203-204 (hibernation, spring mating). — Hermann and Dirks, 1975. Psyche 82: 97-108 (spring nesting behavior).
- Morphology: Snodgrass, 1941. Smithsn. Inst., Misc. Collect. 99 (14): 48-49, figs. 16 I-P (male genitalia). — Hunt and Hermann, 1971. Ga. Ent. Soc., Jour. 5: 210-216, 2 figs. (poison apparatus).
- apachus** Saussure. Western Kans. and Tex., to southern Colo., introduced into Calif.; Mexico (Nuevo Leon, San Luis Potosi, Coahuila, Sonora, Durango). Ecology: Nests suspended from branches, usually at tops of low trees. Parasite: *Pachysomoides fulvus* Cr.; *Sarcophaga* sp.; *Xenos peckii* Kby. Predator: *Chalcoela iphitalis* Wlkr. This is commonly called the Apache wasp in California where it is a pest in fig trees.
- Polistes apachus* Saussure, 1857. Soc. Ent. France, Ann. (3) 5: 314.
- Polistes texanus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 246. ♂, ♀.
- Biology: Rau, 1943. Ent. Soc. Amer., Ann. 36: 522, fig. 15 (nest). — Simmons, Fisher and Tyler, 1948. Ent. Soc. Amer., Ann. 41: 450-455, 1 pl. (nest, life history). — Snelling, 1952. Pan-Pacific Ent. 28: 177 (hibernation).
- canadensis** (Linnaeus). Southern Ariz. to Peru, Bolivia and Paraguay. Ecology: Nests in trees, culverts and under eaves of buildings.
- Vespa canadensis* Linnaeus, 1758. Syst. Nat., ed. 10, v. 1, p. 574.
- Biology: Rau, 1943. Ent. Soc. Amer., Ann. 36: 524, fig. 11 (nest).
- carnifex carnifex** (Fabricius). South. Tex., Ariz. (Nogales); Mexico to Argentina. Ecology: Nests under eaves, in culverts and in shrubby trees. Other subspecies occur in South America.
- Vespa caruifex* Fabricius, 1775. Syst. Ent., p. 365. ♀.
- Polistes omerata* Lepeletier, 1836. Hist. Nat. Ins., Hym. 1: 524. ♂.
- Polistes valida* Say, 1837. Boston Jour. Nat. Hist. 1: 389. ♀, ♂.
- Polistes transverso-strigata* Spinola, 1851. Accad. Sci. Torino, Mem. (2) 13: 78. ♀.
- Biology: Rau, 1943. Ent. Soc. Amer., Ann. 36: 521, figs. 3, 4 (nest). — Corn, 1973 (1972). Psyche 79: 150-157, 2 figs. (nest, behavior).
- carolina** (Linnaeus). Eastern U. S., Pa. to Fla., west to Kans. and central Tex. Ecology: Nests in very sheltered situations, such as in hollow trees or in sidings of houses. Parasite: *Xenos nigrescens* Brues, *X. rubiginosi* (Pierce); *Pachysomoides fulvus* (Cr.). Predator: *Dicymolomia pegasalis* (Wlkr.); *Chalcoela iphitalis* Wlkr. *P. carolina* (L.) has been

confused with *perplexus* Cr. in the past. Some of the parasite-predator records and biological references listed here may actually refer to the latter species.

*Vespa carolina* Linnaeus, 1767. Syst. Nat., Ed. 12, v. 1 (pt. 2), p. 948. ♂.  
*Polistes rubiginosa* Lepeletier, 1836. Hist. Nat. Ins., Hym. v. 1, p. 524. ♂.

Biology: Girault, 1907. Canad. Ent. 39: 355-356 (as predator). — Rau and Rau, 1918. Wasp Studies Afield, pp. 280-283 (prey forage, hibernation). — Rau, 1929. Ent. News 40: 7-13 (behavior female, male at end of season). — Rau, 1931. Brooklyn Ent. Soc., Bul. 26: 115-116 (nest). — Rau, 1931. Psyche 38: 129-144, 6 figs. (nesting habits, pleometrosis). — Wilson, 1933. Fla. Entomologist 17: 12 (as predator). — O'Byrne, 1938. Ent. News 49: 288-289 (nest site).

**comanchus comanchus** Saussure. Southwestern Tex.; Mexico (Coahuila, Durango).

*Polistes comanchus* Saussure, 1857. Soc. Ent. France, Ann. (3) 5: 314.

**comanchus navajoe** Cresson. Western Tex. to Ariz.; Mexico (Sonora, Chihuahua, Durango, Sinaloa). Ecology: Nests in cavities having very small openings.

*Polistes navajoe* Cresson, 1868. Amer. Ent. Soc., Trans. 1: 383. ♀.

**dorsalis californicus** Bohart. Calif., Ariz.; Mexico (Baja California, Sonora, Sinaloa). Parasite: *Xenos peckii* Kby.

*Polistes hunteri californicus* Bohart, 1949. Pan-Pacific Ent. 25: 101. ♂, ♀.

**dorsalis dorsalis** (Fabricius). Va. to Fla., west to Colo., Okla., Tex., N. Mex. south to Honduras.

Ecology: Nests in shrubbery and beneath eaves. Parasite: *Xenos peckii* Kby.

*Vespa dorsalis* Fabricius, 1775. Systema Ent., p. 367. ♀.

*Polistes fuscatus hunteri* Bequaert, 1940. N. Y. Ent. Soc., Jour. 48: 23. ♀, ♂.

Taxonomy: van der Vecht, 1970. K. Nederland. Akad. van Wetensch., Proc., Ser. C, 71: 23 (identity of Fabrician type).

Biology: Spieth, 1948. N. Y. Ent. Soc., Jour. 56: 155-169 (nest, life history). — Hermann, Gerling and Dirks, 1974. Ga. Ent. Soc., Jour. 9: 203-204 (hibernation).

**exclamans arizonensis** Snelling. Ariz., Calif.; Mexico (Sonora).

*Polistes exclamans arizonensis* Snelling, 1954. Kans. Ent. Soc., Jour. 27: 152. ♀, ♂.

Biology: Hopkins, 1955. Jour. Econ. Ent. 48: 161-163 — Fye, 1972. Envir. Ent. 1: 55-57 (colony manipulation).

**exclamans bahamensis** Bequaert and Salt. La. to Fla.; Bahamas.

*Polistes bahamensis* Bequaert and Salt, 1931. Ent. Soc. Amer., Ann. 34: 794. ♀, ♂, ♂.

*Polistes exclamans louisianus* Bequaert, 1940. N. Y. Ent. Soc., Jour. 48: 14. ♀.

**exclamans exclamans** Viereck. N. J. to Fla., west to Nebr., Colo., and Tex.; Mexico (Nuevo Leon, Coahuila). Ecology: Nests are usually in sheltered sites, frequently under eaves or roofs. Parasite: *Sarcophaga polistensis* Hall, S. sp.; *Pachysomoides stupidus* (Cr.), *P. fulvus* (Cr.); *Elasmus polistis* Burks; *Monodontomerus minor* (Ratz.). Prey: Arctiidae sp.; *Anisota senatoria* (Sm.); Hesperidae sp.; *Heterocampa* sp.; *Alabama argillacea* (Hbn.), *Autographa* spp., *Feltia subterranea* (F.), *Heliothis zea* (Boddie), *Laphygma frugiperda* (Sm.), *Plathypena scabra* (F.), *Prodenia* prob. *ornithogalli* Guen.; *Colias philodice eurytheme* Bdv.; *Loxostege similalis* (Guen.); *Protoparce sexta* (Johan.); usually obtained from herbaceous vegetation in open fields. Predator: *Dicymolomia pegasalis* (Wlkr.), *Chalcoela iphitalis* Wlkr.

*Polistes exclamans* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 201. ♀.

Taxonomy: Snelling, 1955. Amer. Mus. Novitates 1701: 5-6 (synonymy). — Eickwort, 1969. Evolution 23: 391-405 (variation between sexes and castes).

Biology: Rau, 1943. Ent. Soc. Amer., Ann. 36: 525-526, figs. 7-9 (nest). — Hodapp and Bickley, 1959. Ent. Soc. Wash., Proc. 61: 73 (autumnal swarming). — West, 1968. Psyche 75: 118-123 (distribution, nest founding). — Eickwort, 1969. Insectes Sociaux 16: 67-72 (caste separation female, worker). — Lin, 1972. Ent. Soc. Wash., Proc. 74: 148-155 (male territoriality). — Hermann, Gerling and Dirks, 1974. Ga. Ent. Soc., Jour. 9: 203-204 (hibernation). — Hermann and Dirks, 1974. Ga. Ent. Soc., Jour. 9: 1-8 (smearing on nest by sternal glands). — Hermann, Barron and Dalton, 1975. Ent. News 86: 173-178 (nest founding behavior in spring).

- Morphology: Crouch and Smith, 1958. *Tex. Jour. Sci.* 10: 38-59, 20 figs. (sting and associated glands).
- flavus** Cresson. Southern Calif., Nev., Utah, Ariz., N. Mex., western Tex.; Mexico (Sonora, Chihuahua, Coahuila). Parasite: *Xenos peckii* Kby.
- Polistes flavus* Cresson, 1868. *Amer. Ent. Soc., Trans.* 1: 383. ♀.
- fuscatus aurifer** Saussure. B. C. to Mont., south to Calif. and Nev.; Mexico (Baja California). Ecology: Nests in sheltered situations. Adventive in Hawaii, Johnston, Nihoa and Society Islands. Parasite: *Gordius* sp.; *Xenos peckii* Kby.
- Polistes aurifer* Saussure, 1853. *Etudes sur la famille des Vespides*, v. 2, p. 78. ♀.
- Polistes anaheimensis* Provancher, 1888. *Addit. Corr. Faune Ent. Canada*, Hym., p. 423. ♂, ♀.
- Polistes fuscatus* var. *utahensis* Hayward, 1933. *Utah Acad. Sci., Proc.* 10: 142. ♂, ♀.
- Polistes fuscatus connectens* Bequaert, 1940. *N. Y. Ent. Soc., Jour.* 48: 21. ♀, ♂.
- Polistes fuscatus montanus* Bequaert, 1940. *N. Y. Ent. Soc., Jour.* 48: 26. ♀, ♂.
- Taxonomy: Snelling, 1954. *Kans. Ent. Soc., Jour.* 27: 154 (synonymy).
- Biology: Duncan, 1928. *Pan-Pacific Ent.* 5: 90 (nest materials). — Bohart, 1942. *Pan-Pacific Ent.* 18: 30 (feeding, hibernation). — Snelling, 1952. *Pan-Pacific Ent.* 28: 177 (hibernation). — Snelling, 1954. *Kans. Ent. Soc., Jour.* 27: 154 (nest site).
- fuscatus bellicosus** Cresson. S. C. to Fla., west to Tex.
- Polistes bellicosus* Cresson, 1872. *Amer. Ent. Soc., Trans.* 4: 247. ♂, ♀.
- Biology: Rau and Rau, 1918. *Wasp Studies Afield*, pp. 294-295 (drinking habits).
- fuscatus centralis** Hayward. Western Tex., Colo., N. Mex., Ariz., Utah, Calif.; Mexico (Baja California, Sonora, Chihuahua, Coahuila). Ecology: Nests in sheltered situations.
- Polistes fuscatus* var. *centralis* Hayward, 1933. *Utah Acad. Sci., Proc.* 10: 143. ♂, ♀.
- fuscatus fuscatus** (Fabricius). U. S. east of Rocky Mts. except in extreme southeast and Mich. where it is replaced by *f. bellicosus* Cr. and *f. laurentianus* Beq. respectively. Ecology: Nests in sheltered situations, frequently beneath eaves and roofs, or in cavities near ground. Parasite: *Xenos peckii* Kby.; *Pachysomoides fulvus* (Cr.); *Elasmus polistis* Burks; *Dasyneura castor* (Bl.). Prey: *Estigmene acrea* (Dru.), *Hyphantria cunea* (Dru.); Geometridae spp.; Hesperidae spp.; *Everes comyntes* (Godt.); *Dasylophia anguina* (A. and S.), *Heterocampa manteo* (Dblld.); *Euptoieta* sp., pupa; *Acrionicta* sp., *Autographa* spp., *Feltia subterranea* (F.), *Heliothis zea* (Boddie), *H. virescens* (F.), *Hypsorophus hormos* Hbn., *Laphygma frugiperda* (Sm.), *Peridroma margaritosa* (Haw.), *Plathypena scabra* (F.), *Prodenia* prob. *ornithogalli* Guen., *Schinia* sp.; *Cotias philodice eurytheme* Bdv., *Phoebis* sp.; *Loxostege* sp.; *Protoparce sexta* (Johan.); Orthoptera spp.; usually obtained from herbaceous vegetation in open fields. Predator: *Dicymolomia pegasalis* (Wlkr.), *Chalcoela iphitalis* Wlkr.
- Vespa fuscata* Fabricius, 1793. *Ent. System.*, v. 2, p. 260.
- Vespa nestor* Fabricius, 1798. *Sup. Ent. System.*, p. 262.
- Polistes pallipes* Lepeletier, 1836. *Hist. Nat. Ins. Hym.*, v. 1, p. 530. ♀.
- Polistes exilis* Saussure, 1853. *Etudes sur la famille des Vespides*, v. 2, p. 85.
- Polistes variatus* Cresson, 1872. *Amer. Ent. Soc., Trans.* 4: 247. ♂, ♀.
- Polistes pallidipes* Dalla Torre, 1894. *Cat. Hym.*, v. 9, p. 133. Emend.
- Biology: Girault, 1911. *Wis. Nat. Hist. Soc., Bul.* 9: 49-63 (observations on female). — Davis, 1919. *Brooklyn Ent. Soc., Bul.* 14: 122-123 (nest). — Bequaert, 1923. *Brooklyn Ent. Soc., Bul.* 18: 73-80 (vestigial pleometrosis). — Davis, 1924. *Staten Island Inst. Arts and Science* 2: 137-138 (nest). — Bugbee, 1936. *Ent. Soc. Amer., Ann.* 29: 614-616 (nest). — Gaul, 1940. *N. Y. Ent. Soc., Jour.* 48: 391-393 (artificial brood rearing). — Beall, 1942. *Canad. Field-Nat.* 56: 64-67 (autumnal swarming). — Eberhard, 1969. *Mich. Univ., Mus. Zool., Misc. Pub.* 140: 1-101 (social biology). — Gibo, 1972. *N. Y. Ent. Soc., Jour.* 80: 105-108 (hibernation sites, temperature tolerance). — Hermann and Dirks, 1974. *Ga. Ent. Soc., Jour.* 9: 1-8 (smearing on nest by sternal glands). — Hermann, Gerling and Dirks, 1974. *Ga. Ent. Soc., Jour.* 9: 203-204 (hibernation). — Gibo, 1974. *Canad. Ent.* 106: 101-106 (colony founding in lab.). Rau published many notes on this taxon as *variatus*; they are cited under the generic heading.

- Morphology: Marshall and Dernehl, 1905. Ztschr. f. Wiss. Biol. 80: 122-154, 2 pls. (embryology). — Marshall, 1907. Ztschr. f. Wiss. Biol. 86: 173-213, 3 pls. (embryology).
- fuscatus laurentianus** Bequaert. Que., Ont., Mich.  
*Polistes fuscatus laurentianus* Bequaert, 1942. Canad. Ent. 74: 159. ♂, ♀.
- instabilis** Saussure. South. Tex.; Mexico to Costa Rica. Ecology: Nests in trees, in culverts, under bridges and overhanging rocks. Predator: *Chalcoela iphitalis* Wlkr.  
*Polistes instabilis* Saussure, 1853. Etudes sur la famille des Vespides, v. 2, p. 91, pl. 10, fig. 2, pl. 11, fig. 1. ♀.
- Biology: Rau, 1943. Ent. Soc. Amer., Ann. 36: 524-525, figs. 5, 6, 13 (nest).
- kaibabensis** Hayward. Ariz. (Grand Canyon), southern Utah.  
*Polistes canadensis* var. *kaibabensis* Hayward, 1932. Utah Acad. Sci., Proc. 9: 89. ♂, ♀.
- major castaneicolor** Bequaert. Southern N. Mex. and Ariz.; Mexico (Baja California, Sonora, Chihuahua, Jalisco), Colombia.  
*Polistes major* var. *castaneicolor* Bequaert, 1936. Ent. News 47: 12. ♀, ♂.
- major major** Beauvois. Southern Fla., Tex., N. Mex. and Ariz.; Mexico south to Brazil; Antilles. Ecology: Nests in shrubbery, in culverts and beneath eaves. Parasite: *Elasmus polistis* Burks. Predator: *Chalcoela iphitalis* Wlkr.  
*Polistes Major* Beauvois, 1818. Ins. Afr., Amer., p. 206.  
*Polistes major bakeri* Bequaert, 1940. N. Y. Ent. Soc., Jour. 48: 15. ♂, ♀.
- Biology: Rau, 1943. Ent. Soc. Amer., Ann. 36: 522, fig. 12 (nest).
- major palmarum** Bequaert. Southern Calif.; Mexico (Baja California).  
*Polistes major* var. *palmarum* Bequaert, 1936. Ent. News 47: 11. ♀.
- metricus** Say. Eastern U. S. from N. Y. to Fla., west to Nebr., Okla. and Tex. Ecology: Nests in shrubbery. Parasite: *Xenos peckii* Kby.; *Sarcophaga polistensis* Hall, S. sp.; *Sphécophaga vesparum burra* (Cr.); *Pachysomoides fulvus* (Cr.). Predator: *Dicymolomia pegasalis* (Wlkr.), *Chalcoela iphitalis* Wlkr.  
*Polistes metrica* Say, 1831. Indiana: School Press, New Harmony, p. 15.
- Taxonomy: Rau, 1929. Psyche 36: 34-36 (color variation).
- Biology: Turner, 1912. Psyche 19: 184-190 (orphan nest, feeding, homing, hunting). — Pellett, 1916. Iowa Acad. Sci., Proc. 23: 275-284 (life history, behavior in lab.). — Rau and Rau, 1918. Wasp Studies Afield, pp. 244-280, 291-294 (homing experiments with female, worker; nest sites). — Rau, 1928. Psyche 35: 153-156 (trophallaxis). — Rau, 1929. Canad. Ent. 61: 25-30 (feeding experiments). — Rau, 1929. Ent. News 40: 226-232, 256-259 (orphan nests). — Rau, 1930. Canad. Ent. 62: 143-147, 2 figs. (life history, nest destruction). — Rau, 1931. Brooklyn Ent. Soc., Bul. 26: 111-113 (nest, nest site). — Rau, 1935. Ent. News 46: 25-27 (female duties). — Madden and Chamberlain, 1938. Jour. Econ. Ent. 31: 705 (as predator). — Hermann, Gerling and Dirks, 1974. Ga. Ent. Soc., Jour. 9: 203-204 (hibernation). In these papers Rau cited *metricus* as *pallipes*.
- pacificus pacificus** Fabricius. South. Tex. to South America. Other subspp. occur in Central and South America.  
*Polistes pacifica* Fabricius, 1805. Systema Piezatorum, p. 274. ♀.
- Taxonomy: Bequaert, 1937. Inst. Biol. Veget. Arch. 3: 196.
- perplexus** Cresson. Md. to Ga., west to southern Ill., Kans., Okla. and Tex. *P. perplexus* Cr. has been confused with *carolina* (L.) in the past. Some of the parasite-predator records and biological references listed under the latter species may actually refer to *perplexus*.  
*Polistes perplexus* Cresson, 1870. Amer. Ent. Soc., Trans. 4: 245. ♂.  
*Polistes generosus* Cresson, 1870. Amer. Ent. Soc., Trans. 4: 246. ♂.
- UNPLACED TAXON OF POLISTES LATREILLE
- nigripennis** (DeGeer). Pa.  
*Vespa nigripennis* Degeer, 1773. Mem. Serv. Hist. des Ins., v. 3, p. 582, pl. 29, fig. 10.  
 Bequaert suggested that this was possibly the same as *rubiginosus* (= *carolina*).

## SUBFAMILY POLYBIINAE

Revision: Bequaert, 1933. Ent. Amer. (n. s.) 13: 87-150, 3 pls. (Nearctic taxa).

## Genus MISCHOCYTTARUS Saussure

The nests are similar to those of *Polistes*, but average somewhat smaller. They consist of a single free comb of hexagonal paper cells and are attached by a short pedicel in North American forms to a natural or man-made support usually some distance from the ground. Each colony is generally started by a single fertile female or queen.

Revision: Richards, 1945. Roy. Ent. Soc., London, Trans. 95: 295-462, 4 pls., 119 figs. (New World spp.).

Biology: Jeanne, 1972. Mus. Comp. Zool., Bul. 144: 63-150, 46 figs., 4 pls. (biology, social behavior of *M. drewseni* Sauss.).

## Genus MISCHOCYTTARUS Subgenus MISCHOCYTTARUS Saussure

*Mischocythorus* (!) Saussure, 1853. Etudes sur la famille des Vespides, v. 1, Introd. p. VIII. Nom. nud.

*Mischocyttarus* Saussure, 1853. Etudes sur la famille des Vespides, v. 2, p. 19.

Type-species: *Zethus labiatus* Fabricius. Desig. by Ashmead, 1902.

The species occur in Mexico, Central America, and South America.

## Genus MISCHOCYTTARUS Subgenus KAPPA Saussure

*Kappa* Saussure, 1854. Etudes sur la famille des Vespides, v. 2, p. 200.

Type-species: *Polybia injucunda* Saussure. Desig. by Bequaert, 1933.

*cubensis cubensis* (Saussure). Ga., Fla., Ala.; Bahamas, Cuba.

*Polybia cubensis* Saussure, 1854. Etudes sur la famille des Vespides, v. 2, p. 202. ♂, ♀.

*Polybia phthisica* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 167. ♂, ♀.

*cubensis mexicanus* (Saussure). Tex. (Brownsville); Mexico, Central America.

*Polybia mexicana* Saussure, 1854. Etudes sur la famille des Vespides, v. 2, p. 203. ♀.

*flavitarsis centralis* Bequaert. Utah, Colo., Nebr., N. Mex., western Tex.

*Mischocyttarus flavitarsis* var. *centralis* Bequaert, 1933. Ent. Amer. (n. s.) 13: 129. ♀, ♂.

*flavitarsis flavitarsis* (Saussure). Calif., Oreg., Utah, Colo., Nebr., Ariz.

*Polybia flavitarsis* Saussure, 1854. Etudes sur la famille des Vespides, v. 2, p. 199. ♀.

Biology: Smith, 1944. Pan-Pacific Ent. 20: 80 (hibernation site). —Snelling, 1953. Kans. Ent. Soc., Jour. 26: 143-145 (hibernation, nest size and site).

*flavitarsis idahoensis* Bequaert. B. C., Wash., Oreg., Idaho, Mont., Nev., Utah, Colo.

*Mischocyttarus flavitarsis* var. *idahoensis* Bequaert, 1933. Ent. Amer. (n. s.) 13: 133. ♀, ♂.

*flavitarsis kaibabensis* Bequaert. Ariz. (Grand Canyon, Kayenta).

*Mischocyttarus flavitarsis* var. *kaibabensis* Bequaert, 1933. Ent. Amer. (n. s.) 13: 133. ♀.

*flavitarsis navajo* Bequaert. Ariz.; Mexico (Chihuahua).

*Mischocyttarus flavitarsis* var. *navajo* Bequaert, 1933. Ent. Amer. (n. s.) 13: 131. ♀, ♂.

## Genus BRACHYGASTRA Perty

*Brachygastera* Perty, 1833. Delect. Anim. Articuli. Brasil, p. 145.

Type-species: *Brachygastera analis* Perty Desig. by Bequaert, 1933 (= *Polistes lecheguana* Latreille).

*Nectarina* Swainson and Shuckard, 1840. On the history and natural arrangement of insects, p. 183. N. name for *Brachygastera*.

*Melissia* Shuckard, 1841. In White, Ann. and Mag. Nat. Hist. 7: 320. N. name for *Nectarina*.

*Caba* Ihering, 1904. Rev. Mus. Paulista 6: 103. N. name for *Nectarina*.

The genus is essentially Neotropical but one species extends its range into southern United States. The perennial paper nests are attached to branches of low trees and are begun by small



swarms of fertile queens and workers. An average nest is subglobular, is enclosed in a single sheet of papery material, is about 1 foot in diameter, contains about 50,000 cells arranged in layers, has several entrances, and has spiral ramps connecting the tiers of cells. The adults collect and store honey but do not cap the cells.

Revision: Buysson, 1905. Soc. Ent. France, Ann. 74: 537-566, 6 pls. — Naumann, 1968. Kans. Univ. Sci. Bul. 47: 929-1003, 69 figs. (New World spp.).

**mellifica** (Say). Southern Tex. and Ariz. to Costa Rica and Panama (?).

*Polistes mellifica* Say, 1837. Boston Jour. Nat. Hist. 1 (pt. 4): 390. ♂, ♀.

*Nectarina mellifera* Dalla Torre, 1904. Gen. Ins., fasc. 19, p. 86. Emend.

*Chartergus aztecus* Cameron, 1906. Invertebrata Pacifica 1: 154. ♀. Preocc.

*Chartergus arizonaensis* Cameron, 1907. Invertebrata Pacifica 1: 181. ♀.

*Chartergus centralis* Cameron, 1907. Invertebrata Pacifica 1: 181. ♀.

*Nectarina cameroni* Meade-Waldo, 1911. Ann. and Mag. Nat. Hist. (8) 7: 112. N. name.

Biology: Barber, 1905. Ent. Soc. Wash., Proc. 7: 25 (nest). — Schwarz, 1929. Nat. Hist. 29: 421-426, 5 figs. (nest, honey production).

### Genus POLYBIA Lepeletier

*Polybia* Lepeletier, 1836. Hist. Nat. Ins. Hym., v. 1, p. 533.

Type-species: *Polistes liliacea* Fabricius Desig. by Ashmead, 1902.

*Myrapetra* White, 1841. Ann. and Mag. Nat. Hist. 7: 320.

Type-species: *Myrapetra scutellaris* White. Monotypic.

*Myrapetra* Curtis, 1844. Linn. Soc. London, Proc., p. 188. Emend.

*Alpha* Saussure, 1853. Etudes sur la famille des Vespides, v. 2, p. 167.

Type-species: *Polybia bifasciata* Saussure. Desig. by Bequaert, 1944.

*Eupolybia* Dalla Torre, 1904. In Wytsman, Gen. Ins., fasc. 19, p. 76.

Type-species: *Polistes liliacea* Fabricius. Present desig. by Richards.

The species of *Polybia* build phragmocytarous nests which consist of one to many combs attached to a branch, leaf or rock, surrounded by an envelope of carton or of mud containing an exit hole at the side or bottom of the comb. A number of species enlarge the nest by adding successive combs, each covered by the envelope, so that access to the upper combs is through the exit-holes of earlier stages of the nest. Some of the taxa store large quantities of honey, or sexual castes of ants or termites, some of which are fed to larvae and some of which maintain the adults during hibernation. Larvae may also be fed on partially masticated insects.

Taxonomy: Richards, 1951. In Richards and Richards, Royal Ent. Soc. London, Trans. 102: 129-150, figs. 11-16 (taxa allied to *occidentalis* (Oliv.) with key including the two taxa occurring in America north of Mexico).

**diguetana** Buysson. Ariz. (Nogales); Mexico, Central America, Peru. Ecology: Buysson noted that the nest was like that of typical *occidentalis* which consists of as many as 6 combs surrounded by a carton envelope.

*Polybia occidentalis* var. *diguetana* Buysson, 1905. Soc. Ent. France, Bul., p. 9. ♀, ♂, ♂.

**occidentalis nigratella** Buysson. Ariz. (Nogales); Mexico, Guatemala, Honduras. Typical *occidentalis* (Oliv.) occurs in South America.

*Polybia occidentalis* var. *nigratella* Buysson, 1905. Soc. Ent. France, Bul., p. 9. ♀, ♂.

*Polybia occidentalis nausicaa* Richards, 1951. In Richards and Richards, Royal Ent. Soc. London, Trans. 102: 140. ♀, ♂. N. syn. (O. W. Richards).

### SUBFAMILY VESPINAE

This is morphologically the most specialized subfamily of the social wasps. Component species are commonly called hornets (those nesting above ground in North America) and yellow jackets (those nesting usually subterraneously). The nests consist of several to many combs of hexagonal cells composed of paper; cells constructed early in the year may be used for several larvae in succession. The combs are usually enclosed in a paper envelope. The nests are annual, new queens and males being produced late in the summer or early in the fall; the newly fertilized queens overwinter and begin new nests in the spring. There are relatively few precise records

of the insects used to feed vespine larvae; apparently dismembered and masticated adult Diptera and honeybees are commonly used; the wasps may also obtain bits of flesh from fresh and decaying carcasses. Adult vespines feed on liquid foods, primarily nectar or honey; some species are known to prey upon adult honeybees, which they kill and extract nectar from the crop.

Revision: Bequaert, 1932. Ent. Amer. (n. s.) 12: 71-138, 6 figs. (N. Amer. taxa).

Taxonomy: McFarland, 1888. Amer. Ent. Soc., Trans. 15: 297 (key). — Bequaert, 1930.

Brooklyn Ent. Soc., Bul. 25: 59-70 (generic and subgeneric classification). — Bequaert, 1935.

Brooklyn Ent. Soc., Bul. 30: 119-124 (check list, correction, additions). — Duncan, 1939.

Stanford Univ., Pubs., Univ. Ser. Biol. Sci. 8 (1): 85-97 (genera). — Bequaert, 1941.

Brooklyn Ent. Soc., Bul. 36: 111-117 (corrections, additions).

Biology: Duncan, 1939. Stanford Univ., Pubs., Univ. Ser. Biol. Sci. 8 (1): 98-176 (composite summary for American spp.).

### Genus VESPA Linnaeus

*Vespa* Linnaeus, 1758. Syst. Nat., ed. 10, v. 1, p. 343.

Type-species: *Vespa crabro* Linnaeus. Desig. by Lamarck, 1801.

*Macrovespa* Dalla Torre, 1904. In Wytsman, Gen. Ins., fasc. 19, p. 64.

Type-species: *Vespa crabro* Linnaeus. Desig. by Bequaert, 1930.

The giant hornets are conspicuous members of the wasp fauna in the Palaearctic and Oriental Regions; one taxon is adventive in North America. The species of *Vespa* are quite diverse in nesting habits; some construct aerial nests in trees, others nest in sheltered sites above ground, such as in hollow trees, and still others are subterranean. The nests, especially in exposed situations, are usually enclosed in a paper envelope.

*crabro germana* Christ. Ont., Mass., R. I., Conn., N. Y., N. J., Pa., Del., Md., D. C., Va., N. C., S. C., Ga., Ala., W. Va., Ohio, Ind., Ky., Tenn., Wis., N. Dak., S. Dak.; central and western Europe. Ecology: Nests in very sheltered sites above ground, frequently in hollow trees, attics, porches, sheds, and rarely in underground cavities; exposed nests have a complete paper envelope, but in quite sheltered sites the envelope may be only partial or completely lacking. Adventive from Europe in mid-1800's. The official common name is the giant hornet; in some rural areas of the mid-Atlantic states it is known as the hybrid bee. Typical *crabro* L. and other subspecies occur in the Palaearctic Region.

*Vespa crabro germana* Christ, 1791. Naturgesch. Insekt. Bienen, Wespen u.

Ameisengeschl., p. 215.

*Vespa crabro vulgata* Birula, 1925. Arch. f. Naturgesch. 90, Abt. A, H. 12, p. 100. ♀, ♂, ♂.

Taxonomy: Bequaert, 1931. Konowia 10: 101-109 (color forms of *crabro* L. with key).

Biology: Beutenmuller, 1898. N. Y. Ent. Soc., Jour. 6: 199, pls. 9-10 (nest). — Felt, 1915. N. Y. State Mus., Bul. 180: 71-73, pl. 2 (nest). — Cory, 1931. Jour. Econ. Ent. 24: 50-52 (nest, injury to lilac, apples). — Ikan *et al.*, 1969. Jour. Insect Physiol. 15: 1703-1712 (queen pheromones). — Islay and Schaudinschky, 1973. Acoust. Soc. Amer., Jour. 53: 640-649 (acoustical communication).

Morphology: Snodgrass, 1941. Smithsn. Inst., Misc. Coll. 99 (14): 49-50, pl. 17, figs. I-Q, pl. 18, figs. A-D (male genitalia).

### Genus VESPULA Thomson

These smaller social vespines are restricted to the Holarctic Region.

Revision: Miller, 1961. Canad. Ent., Sup. 22, v. 93: 1-52, 84 figs., 15 maps.

Taxonomy: Sladen, 1918. Ottawa Nat. 32: 71-72 (key to Canadian spp.). — Miller, 1958 (1956).

Tenth Internatl. Cong. Ent., Proc. 1: 257-264 (nomenclature and distribution). — Fluno, 1973. Ent. Soc. Wash., Proc. 75: 80-83, 1 fig. (differentiation of subgenera by attraction to chemical).

Biology: Taylor, 1939. Ent. Soc. Amer., Ann. 32: 304-315 (origin and evolution of social parasitism). — Gaul, 1941. Psyche 48: 16-19 (artificial housing of colonies). — Gaul, 1942.

Brooklyn Ent. Soc., Bul. 37: 57-61 (brood rearing). —Morse and Gary, 1961. Bee World 42: 179-181 (predation on honeybees). —Akre, Hill and MacDonald, 1973. Jour. Econ. Ent. 66: 803-805, 4 figs. (artificial housing of colonies).

### Genus VESPULA Subgenus VESPULA Thomson

*Vespula* Thomson, 1869. Opusc. Ent., v. 1, p. 79.

Type-species: *Vespa austriaca* Panzer. Desig. by Ashmead, 1902.

*Pseudovespa* Schmiedeknecht, 1881. Ent. Nachr. 7: 314.

Type-species: *Vespa austriaca* Panzer. Monotypic.

*Paravespula* Bluethgen, 1938. Konowia 16: 271.

Type-species: *Vespa vulgaris* Linnaeus. Orig. desig.

*Allovespula* Bluethgen, 1943. Stettin. Ent. Ztg. 104: 149.

Type-species: *Vespa rufa* Linnaeus. Orig. desig.

Nests are usually underground or close to it in hollow logs or stumps. Combs, except for a small conical area around the main suspensorium, are usually essentially plane. Members of this subgenus are commonly called yellow jackets.

**acadica** (Sladen). Transcontinental in Canadian Zone from Newfoundland to Yukon Terr. and Alaska, Maine to Minn., west of 100th meridian south to N. Mex. and Calif. Ecology:

Location of nests variable, sometimes aerial, subterranean or in rotten logs.

*Vespa rufa* var. *americana* Buysson, 1905. Soc. Ent. France, Ann. 63: 499. ♂. Preocc.

*Vespa acadica* Sladen, 1918. Ottawa Nat. 32: 72. ♂, ♀, ♀.

*Vespula rufa sladeni* Bequaert, 1931. Ent. Amer. (n. s.) 12: 102. ♂, ♀, ♀.

Biology: Sladen, 1918. Ottawa Nat. 32: 72 (nest site). —MacDonald, Akre and Hill, 1975. Kans. Ent. Soc., Jour. 48: 114-121 (nest location and structure).

**atropilosa** (Sladen). Canada and U. S. west of 100th meridian mostly in Canadian and Transition Zones; Mexico (Baja California). Ecology: Most nests are subterranean and usually in rodent burrows. Parasite: *Sphecophaga vesparum burra* (Cr.); *Triphleba lugubris* (Meig.).

*Vespa atropilosa* Sladen, 1918. Ottawa Nat. 22: 72. ♀, ♀.

Biology: MacDonald, Akre and Hill, 1974. Melanderia 18: 1-93, 13 figs. (comparative biology and behavior). —MacDonald, Akre and Hill, 1975. Kans. Ent. Soc., Jour. 48: 53-63 (nest associates). —MacDonald, Akre and Hill, 1975. Kans. Ent. Soc., Jour. 48: 114-121, 2 figs. (nest location and structure).

**austriaca** (Panzer). Que., Ont., Man., Sask., Alta., B. C., N. W. T., Alaska, Maine, N. Y., N. J., Colo., N. Mex., Utah, Calif., Oreg., Wash., Idaho; Holarctic. Host: Inquiline in nests of *rufa* (L.) in Europe; North American host(s) unknown. The worker caste is absent.

*Vespa austriaca* Panzer, 1799. Faunae Ins. German., h. 63, pl. 2. ♂.

*Vespa borealis* Smith, 1843. Zoologist 1: 170. ♀. Preocc.

*Vespa arborea* Smith, 1849. Zoologist 7, App., p. lx. N. name.

*Vespa infernalis* Saussure, 1853. Etudes sur la famille des Vespides, v. 2, p. 139. ♀.

*Vespa tripunctata* Packard, 1870. Chicago Acad. Sci., Trans. 2: 26. ♀.

**consobrina** (Saussure). Transcontinental in Canada and northern U. S. in Canadian and Transition Zones, W. Va., N. C., Ga., Colo., N. Mex., Ariz., Calif. Ecology: Nests are usually subterranean, but occasionally are in shrubs just above the ground surface.

*Vespa consobrina* Saussure, 1864. Etudes sur la famille des Vespides, v. 2, p. 141. ♀.

*Vespa sculesta* McFarland, 1888. Amer. Ent. Soc., Trans. 15: 298. ♂, ♀, ♀.

*Vespa sulcata* Howard, 1901. Insect Book, pl. 6, fig. 18. ♀.

Biology: Dow, 1930. Boston Soc. Nat. Hist., Bul. 56: 12, 1 fig. (nest).

**germanica** (Fabricius). N. Y., N. J., Pa., Del., Md.; Europe. Ecology: Nests in sheltered situations, frequently in structures. Adventive from Europe, apparently in mid-20th century. References to taxonomy, biology and morphology of the Palaearctic population will be found in Guiglia, 1973 (1972), Les Guepes Sociales d'Europe Occidentale et Septentrionale, vol. 6 of Faune de l'Europe et du Bassin Méditerranéen.

*Vespa Germanica* Fabricius, 1793. Ent. System., v. 2, p. 256.

Taxonomy: Menke and Snelling, 1975. U. S. Dept. Agr., Coop. Ins. Rpt. 25: 193-200, 33 figs. (characters to distinguish from native North American spp.).

*intermedia* (Buysson). Newfoundland, Que., Man., Sask., Alta., N. W. T., Yukon Terr., Alaska in Hudsonian Zone.

*Vespa rufa* var. *intermedia* Buysson, 1905. Soc. Ent. France, Ann. 73: 591. ♂, ♀.

**maculifrons** (Buysson). Southern Canada and U. S. east of 100th meridian in Transition and Austral Zones. Ecology: Nests are usually subterranean, occasionally in decayed stumps or logs; nest usually contains 4-8 combs, rarely only a single comb. It may live as an inquiline in nests of *vulgaris* (L.) and interbreed with it. Parasite: *Vespula squamosa* (Dru.). *V. maculifrons* was frequently misidentified as *germanica* in publications prior to 1931.

*Vespa maculifrons* Buysson, 1905. Soc. Ent. France, Ann. 63: 608.

*Vespa communis* var. *flavida* Sladen, 1918. Ottawa Nat. 32: 71. ♀.

Biology: Couper, 1870. Canad. Ent. 2: 49-53 (nest). — Marlatt, 1891. Ent. Soc. Wash., Proc. 2: 80-83 (nest). — Rau and Rau, 1918. Wasp Studies Afield, pp. 295-297, fig. 53 (foraging, nest). — Beamer, 1925. Ent. News 36: 309-310 (hibernation female). — Rau, 1930. Ent. News 41: 185-190, pl. 19 (life history, nest). — Rau, 1931. Brooklyn Ent. Soc., Bul. 26: 85-89, pl. 4 (nest, colonization). — Bromley, 1931. N. Y. Ent. Soc., Jour. 39: 129 (foraging, predation). — Gaul, 1948. Brooklyn Ent. Soc., Bul. 43: 37-41 (interspecific tolerance). — Haviland, 1962. Ent. Soc. Wash., Proc. 64: 181-183 (colony size). — Kurezewski, 1968. N. Y. Ent. Soc., Jour. 76: 84-86 (predation). — Baldur, 1968. Ent. Soc. Wash., Proc. 70: 336-338, 1 fig. (inquilinity and interbreeding with *vulgaris*). — Simon and Benton, 1968. Ent. Soc. Amer., Ann. 61: 542 (winter activity in aerial nest). — Green, Heckman, Benton and Coon, 1970. Ent. Soc. Amer., Ann. 63: 1197-1198, 2 figs. (exposed aerial nest). — MacDonald and Matthews, 1975. Science 190: 1003-1004, 1 fig. (parasite).

**pennsylvanica** (Saussure). Canada and western U. S. west of 100th meridian in Canadian and Transition Zones; Mexico (Michoacan, Mexico). Ecology: Nests are subterranean.

Parasite: *Bareogonolus canadensis* (Harr.); *Sphecophaga vesparum burra* (Cr.); *Triphleba lugubris* (Meig.).

*Vespa pennsylvanica* Saussure, 1857. Stettin. Ent. Ztg. 18: 117. ♀.

*Vespa occidentalis* Cresson, 1874. Amer. Ent. Soc., Trans. 5: 100. ♀, ♂. Preocc.

Biology: Snow, 1882. Psyche 3: 339 (predation). — Metzmain, 1903. Entomologist 36: 137 (female hibernation). — Duncan, 1939. Stanford Univ., Pubs., Univ. Ser. Biol. Sci. 8 (1): 98-173 (nest, life history). — Smith, 1956. Ent. News 67: 141-146, 1 pl. (nest). — Chapman, 1963. Ecology 44: 766-767 (predation). — MacDonald, Akre and Hill, 1974. Melanderia 18: 1-93, 13 figs. (comparative biology and behavior).

Morphology: Duncan, 1939. Stanford Univ., Pubs., Univ. Ser. Biol. Sci. 8 (1): 13-84, pls. I-XXVII (female, male).

**squamosa** (Drury). Ont., N. Y. to Wis. and Iowa, south to Fla. and Tex., most common in Austral Zones; Mexico, Guatemala. Host: *Vespula maculifrons* (Buyss.), *V. vidua* (Sauss.); the *squamosa* queen is a temporary, apparently facultative social parasite.

*Vespa squamosa* Drury, 1773. Illus. Nat. Hist., Index to pt. 1 published with pt. 2.

*Vespa lineata* Fabricius, 1775. Systema Ent., p. 365.

*Vespa conchacea* Christ, 1791. Naturgesch. Insekt. Bienen, Wespen u. Ameisengeschl., p. 259.

*Vespa cuneata* Fabricius, 1804. Systema Piezatorum, p. 258.

*Vespa cruciata* Lepeletier, 1836. Hist. Nat. Ins. Hym., v. 1, p. 513. Emend. of *cuneata*.

*Vespa bistriata* MacFarland, 1888. Amer. Ent. Soc., Trans. 15: 298. ♀. Preocc.

*Vespa macfarlandi* Lewis, 1897. Amer. Ent. Soc., Trans. 24: 172. ♀. N. name.

*Vespa squamosa* var. (or subsp.) *michoacana* Bequaert, 1941. Ent. News 52: 249. ♀.

Taxonomy: Turner, 1908. Psyche 15: 1-3, 1 pl. (coloration worker, male).

Biology: Taylor, 1939. Ent. Soc. Amer., Ann. 32: 310-313 (temporary parasitism by female in nest of *vidua*). — Gaul, 1947. Brooklyn Ent. Soc., Bul. 42: 87-96 (behavior, nest). — Gaul, 1948. Brooklyn Ent. Soc., Bul. 43: 37-41 (interspecific tolerance). — Tissot and Robinson, 1954. Fla. Ent. 37: 73-92 (aerial and subterranean nests). — MacDonald and Matthews, 1975. Science 190: 1003-1004, 1 fig. (host, nest).

**sulphurea** (Saussure). Oreg., Calif., Nev., Ariz.; Mexico (Baja California). Ecology: Nests are subterranean.

*Vespa sulphurea* Saussure, 1854. Etudes sur la famille des Vespides 2: 137. ♀.

Biology: Bequaert, 1931. Ent. Amer. (n. s.) 12: 112 (nest).

**vidua** (Saussure). N. S., N. B., Ont., in northeastern U. S. from Maine to N. Dak., south to Va. and Iowa, south in Appalachian Mts. to N. C., Ga., mostly in Transition and U. Austral Zones. Ecology: Nests are subterranean. Parasite: *Sphecophaga vesparum burra* (Cr.); *Vespula squamosa* (Dru.), the queen of which is a temporary social parasite.

*Vespa vidua* Saussure, 1854. Etudes sur la famille des Vespides, v. 2, p. 136.

Biology: Taylor, 1939. Ent. Soc. Amer., Ann. 32: 310-313 (nest, parasitism by *squamosa*).

**vulgaris** (Linnaeus). Alaska, Canada, U. S. south to Calif., Ariz., N. Mex., S. Dak., Iowa, Ind., Ill., Ohio, N. C., mostly in Canadian and Transition Zones; Mexico (Michoacan, Mexico); widely distributed in Palaearctic Region; Ecology: Nests are usually subterranean or in stumps with paper envelope present or absent; aerial nests are close to ground and always with envelope. adventive in New Zealand. Parasite: *Sphecophaga vesparum burra* (Cr.). May interbreed with *maculifrons* (Buyss.).

*Vespa vulgaris* Linnaeus, 1758. Syst. Nat., ed. 10, v. 1, p. 572. ♀.

*Vespa communis* Saussure, 1857. Stettin. Ent. Ztg. 18: 117. ♀.

*Vespa alascensis* Packard, 1870. Chicago Acad. Sci., Trans. 2: 27. ♀.

*Vespa westwoodii* Shipp, 1893. Psyche 6: 450.

Biology: Bequaert, 1931. Ent. Amer. (n. s.) 12: 92-93 (nest). —Baldur, 1968. Ent. Soc. Wash., Proc. 70: 332-336, 1 fig. (nest, life history).

#### Genus VESPULA Subgenus DOLICHOVESPULA Rohwer

*Dolichovespula* Rohwer, 1916. Conn. State Geol. and Nat. Hist. Survey, Bul. 22: 642.

Type-species: *Vespa maculata* Linnaeus. Orig. desig.

*Pseudovespula* Bischoff, 1931. Gesell. Naturf. Freunde Sitzber. (1930), p. 346.

Type-species: *Vespa norvegica* var. *adulterina* Buysson. Orig. desig.

*Boreovespula* Bluethgen, 1943. Stettin. Ent. Ztg. 104: 149.

Type-species: *Vespa norvegica* Fabricius. Orig. desig.

*Metavespula* Bluethgen, 1943. Stettin. Ent. Ztg. 104: 149.

Type-species: *Vespa silvestris* Scopoli. Orig. desig.

Nests are usually aerial, suspended at some height or in bushes near the ground. Combs are usually turned up at the margins so as to be concave above.

**albida** (Sladen). Labrador, Newfoundland, Que., Maine, Man., Alta., B. C., N. W. T., Yukon Terr., Alaska, chiefly in Hudsonian Zone. Ecology: Nests are small and subterranean.

*Vespa marginata* Kirby, 1837. Fauna Bor.-Amer., v. 4, p. 265. ♀. Preocc.

*Vespa albida* Sladen, 1918. Ottawa Nat. 32: 71. ♂, ♀.

Biology: Sladen, 1919. Rpt. Canad. Arctic Exped. 1913-18, v. 3, p. 26g (nest).

**arctica** Rohwer. Newfoundland to Yukon Terr., Alaska, in lower U. S. chiefly in Canadian Zone. Host: *Vespula arenaria* (F.). The worker caste is absent.

*Vespa borealis* Lewis, 1897. Amer. Ent. Soc., Trans. 24: 171. ♂, ♀. Preocc.

*Vespula arctica* Rohwer, 1916. Conn. State Geol. and Nat. Hist. Survey, Bul. 22: 642. N. name.

Biology: Wheeler and Taylor, 1921. Psyche 28: 135-144, 3 figs. (permanent social parasitism of *arctica* in nests of *arenaria*). —Wheeler, 1939. Ent. Soc. Amer., Ann. 32: 305-310 (social parasitism in *arenaria* nests).

**arenaria** (Fabricius). In Canada from Newfoundland to Yukon Terr., Alaska, in lower U. S. transcontinental chiefly in Canadian and Transition ones. Ecology: Nests are usually aerial but placed close to ground in shrubbery, occasionally under eaves or roofs, rarely the nests may be attached to tree roots and only partly exposed. Parasite: *Sphecophaga vesparum burra* (Cr.); *Vespula arctica* Roh.

*Vespa arenaria* Fabricius, 1775. Systema Ent., p. 365.

*Vespa borealis* Kirby, 1837. Fauna Bor.-Amer., v. 4, p. 264. Preocc.

*Vespa diabolica* Saussure, 1854. Etudes sur la famille des Vespides, v. 2, p. 138. ♀, ♀.

*Vespa fernaldi* Lewis, 1897. Amer. Ent. Soc., Trans. 24: 171. ♀, ♀.

Biology: Wheeler and Taylor, 1921. Psyche 28: 135-144, 3 figs. (nest, parasite). —Hungerford, 1930. Ent. News 41: 329-330, 1 pl. (nest). —Taylor, 1939. Ent. Soc. Amer., Ann. 32: 305-310 (nest, parasite). —Gaul, 1941. N. Y. Ent. Soc., Jour. 49: 367-369 (taste sensitivity of adults, larvae). —Gaul, 1941. Psyche 48: 16-19 (colony housing, interspecific tolerance). —Gaul, 1942. Brooklyn Ent. Soc., Bul. 37: 57-61 (brood rearing, mating). —Gaul, 1948. Brooklyn Ent. Soc., Bul. 43: 73-79 (distribution of labor). —Sailer, 1950. Kans. Ent. Soc., Jour. 23: 134-137, 3 figs. (nest temperature). —Gaul, 1952. N. Y. Ent. Soc., Jour. 60: 17-20 (flight in stormy weather). —Gaul, 1952. Brooklyn Ent. Soc., Bul. 47: 79-92 (temperature regulation in nest). —Gibo, 1972. N. Y. Ent. Soc., Jour. 80: 105-108 (hibernation sites, temperature tolerance). —Gibo, Yarascavitch and Dew, 1974. Canad. Ent. 106: 503-507, 1 fig. (colony thermoregulation). —Gibo, Dew and Hajduk, 1974. Canad. Ent. 106: 873-879, 2 figs. (relation of colony biomass to calorie production).

**maculata** (Linnaeus). In Canada from Nova Scotia to Yukon Terr., Alaska, in lower U. S. from Maine to Fla., west to 100th meridian in Canadian, Transition, U. and L. Austral Zones, west of 100th meridian chiefly in Canadian, Transition and U. Sonoran Zones. Ecology: Nests are always aerial and are usually suspended from limbs or beneath eaves and roofs. Parasite: *Sphecophaga vesparum burra* (Cr.). The official common name is the bald-faced hornet; sometimes it is also called the white-faced hornet.

*Vespa maculata* Linnaeus, 1763. Centuria Ins. Rar., p. 30.

*Vespa maculata americana* Christ, 1791. Naturgesch. Insekt. Bienen, Wespen u. Ameisengeschl., p. 239.

Biology: Couper, 1870. Canad. Ent. 2: 49-53 (nest). —Fyles, 1903. 33rd Ann. Rpt., Ent. Soc. Ontario, pp. 69-70, figs. 47-48 (nest). —Howard, 1915. Ent. Soc. Wash., Proc. 17: 148 (nest color). —Rau and Rau, 1918. Wasp Studies Afield, pp. 297-298 (predation). —Davis, 1919. Brooklyn Ent. Soc., Bul. 14: 119-123, 1 pl. (nest). —Parker, 1928. Ent. Soc. Wash., Proc. 30: 14 (succession of brood in one cell). —Rau, 1929. Ent. Soc. Amer., Ann. 22: 659-675, 10 figs. (nesting habits). —Bromley, 1931. N. Y. Ent. Soc., Jour. 39: 126-128 (predation). —Betz, 1932. Quart. Rev. Biol. 8: 197-209, 4 figs. (colony size). —Rau, 1934. Brooklyn Ent. Soc., Bul. 19: 170 (hibernating female). —Rau, 1934. Brooklyn Ent. Soc., Bul. 19: 171 (predation). —Baldur, 1936. Canad. Ent. 68: 138-139 (colony size). —Gaul, 1941. Psyche 48: 16-19 (colony housing, interspecific tolerance). —Gaul, 1952. N. Y. Ent. Soc., Jour. 60: 21-24 (metabolic cycles and flight). —Baldur, 1954. Ent. Soc. Amer., Ann. 47: 445-458, 3 pls. (nest structure and growth, foraging, life history, population size). —Gibo, 1972. N. Y. Ent. Soc., Jour. 80: 105-108 (hibernation sites, temperature tolerance). —Howell, 1973. Ent. News 84: 141-142 (predation on *Vespula maculifrons* Buyss.). —Gibo, Yarascavitch and Dew, 1974. Canad. Ent. 106: 503-507, 1 fig. (colony thermoregulation). —Gibo, Dew and Hajduk, 1974. Canad. Ent. 106: 873-879, 2 figs. (relation of colony biomass to calorie production).

Morphology: Bequaert, 1932. Ent. Amer. (n. s.) 12: 73-75, fig. 1 (male genitalia). —Snodgrass, 1941. Smithsn. Inst., Misc. Collect. 99 (14): 49, pl. 17, figs. A-H (male genitalia). —Hermann and Krispy, 1975. Ga. Ent. Soc., Jour. 10: 307-313, 8 figs. (venom apparatus).

**norvegicoides** (Sladen). In Canada from Newfoundland to Yukon Terr., Alaska, in lower U. S. transcontinental chiefly in Canadian Zone. Ecology: Nests in low shrubbery.

*Vespa norvegicoides* Sladen, 1918. Ottawa Nat. 32: 71. ♂, ♀.

Biology: Bequaert, 1932. Ent. Amer. (n. s.) 12: 119 (nest).

## Superfamily POMPIOIDEA

By KARL V. KROMBEIN

This superfamily includes two families, the very large and abundant Pompilidae and the very small and rare Rhopalosomatidae.

Members of the Pompilidae are commonly called spider wasps because they prey exclusively on spiders. Only a single larger spider is stored per cell, rather than a number of smaller spiders as in the spider-preying sphecoid genera such as *Trypoxylon*, *Trypargilum* and *Sceliphron*. The majority of species, including the more primitive forms, capture the spider before preparing a burrow in the soil. Some Pepsinae make multicellular nests in pre-existing cavities in twigs or in the ground, and some build individual mud cells which may be joined in a series; in both types the cell is constructed before the spider is captured. Some genera, such as *Pepsis*, may use the burrow of the prey spider as a nesting site. The peculiar genus *Minagenia* is a spider ectoparasite.

The Rhopalosomatidae are ectoparasites of nymphal crickets.

### Family POMPILIDAE

The entire pompilid fauna of America north of Mexico has been adequately monographed in recent years by Bradley, Evans, Hurd and Townes. References will be found under the headings Pepsinae, *Pepsis*, Aporini, Pompilinae, Pompilini, and Ceropalinae.

**Taxonomy:** Ashmead, 1900-1902. *Canad. Ent.* 32: 145-155, 185-188, 295-296; 34: 79-88, 131-137 (keys to world genera). — Banks, 1912 (1911). *N. Y. Ent. Soc., Jour.* 19: 219-237 (eastern species). — Banks, 1919. *Mus. Compar. Zool., Bul.* 63: 229-248 (western species). — Brimley, 1936. *Elisha Mitchell Sci. Soc., Jour.* 52: 107-131 (N. C. species). — Pate, 1946. *Amer. Ent. Soc., Trans.* 72: 65-137 (generic names and type-species). — Dreisbach, 1948 (1946). *Mich. Acad. Sci., Arts, and Letters, Papers* 32: 239-247 (key to Mich. genera). — Dreisbach, 1949. *Mich. Acad. Sci., Arts, and Letters, Papers* 33: 63-71 (American genera). — Evans, 1959. *Ent. Soc. Amer., Ann.* 52: 430-444, 51 figs. (larva). Except for Evans' paper on larvae, the foregoing references are obsolete for identification purposes; they are superseded by the revisionary papers cited under several of the following subfamily, tribal and generic headings.

**Biology:** Evans, 1953. *Syst. Zool.* 2: 155-172 (comparative ethology). — Evans and Yoshimoto, 1962. *Ent. Soc. Amer., Misc. Pub.* 3: 65-119 (ecology, nesting behavior and prey of northeastern spp.). — Kurecowski and Kurecowski, 1968. *Kans. Ent. Soc., Jour.* 41: 24-33 (prey selection factors).

### SUBFAMILY PEPSINAE

**Revision:** Townes, 1957. *U. S. Natl. Mus., Bul.* 209: 1-220, 129 figs.

## TRIBE PEPSINI

Taxonomy: Dreisbach, 1952. N. Y. Ent. Soc., Jour. 60: 119-125 (key to New World genera).

Genus **CHIRODAMUS** Haliday

*Chirodamus* Haliday, 1837. Linn. Soc. London, Trans. (3) 17: 326.

Type-species: *Chirodamus kingii* Haliday. Monotypic.

*Calopompilus* Ashmead, 1900. Canad. Ent. 32: 188.

Type-species: *Pompilus maculipennis* Smith. Orig. desig.

*Dinocnemis* Banks, 1925. Mus. Compar. Zool., Bul. 67: 336.

Type-species: *Pompilus fortis* Cresson. Desig. by Bradley, 1944.

*Onochares* Banks, 1933. Psyche 40: 9.

Type-species: *Onochares brazoria* Banks (= *Priocnemis Heiligbrodtii* Cresson).

*Trichocurgus* Haupt, 1937. Ztschr. f. Naturw. 91: 127, 134.

Type-species: *Pompilus monachus* Smith. Orig. desig.

*Chrysocurgus* Haupt, 1937. Ztschr. f. Naturw. 91: 127, 134.

Type-species: *Sphex nitida* Fabricius. Orig. desig.

*Derochilus* Banks, 1941. Canad. Ent. 73: 119, 120.

Type-species: *Pompilus validus* Cresson. Orig. desig.

*Reedimia* Banks, 1946. Mus. Compar. Zool., Bul. 96: 482.

Type-species: *Agencia hirsutula* Spinola. Orig. desig.

*Anacyphonyx* Banks, 1946. Mus. Compar. Zool., Bul. 96: 520.

Type-species: *Anacyphonyx fidelis* Banks. Orig. desig.

**albopilosus** (Cresson). N. Y. to Ga., W. Va. in Transition Zone. Ecology: Occurs in rich moist woods from early to late summer.

*Pompilus* (*Agencia*) *albopilosus* Cresson, 1867. Amer. Ent. Soc., Trans. 1: 125. ♂.

*Priocnemis fortella* Banks, 1915. Canad. Ent. 47: 401. ♀.

*Pseudagenia najacra* Brimley, 1928. Elisha Mitchell Sci. Soc., Jour. 43: 203. ♂.

Taxonomy: Bradley, 1944. Canad. Ent. 76: 132 (synonymy of *fortella*, male description).

**deceptus** (Banks). Tex.

*Priocnemis decepta* Banks, 1926. Canad. Ent. 58: 201. ♀.

**feroculis** (Banks). Va., Tex.

*Pseudagenia feroculis* Banks, 1912 (1911). N. Y. Ent. Soc., Jour. 19: 232. ♂.

**fortis** (Cresson). N. Y. to S. C. in Transition Zone. Ecology: Occurs in woods.

*Pompilus* (*Priocnemis*) *fortis* Cresson, 1867. Amer. Ent. Soc., Trans. 1: 113. ♀.

*Pompilus* (*Agencia*) *nigropilosus* Cresson, 1867. Amer. Ent. Soc., Trans. 1: 124. ♂.

*Pseudagenia mariva* Brimley, 1928. Elisha Mitchell Sci. Soc., Jour. 43: 202. ♂.

Taxonomy: Bradley, 1944. Canad. Ent. 76: 131-132 (male description).

**heiligbrodtii** (Cresson). Tex.

*Priocnemis Heiligbrodtii* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 204. ♀.

*Agencia Belfragei* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 205. ♂.

*Onochares brazoria* Banks, 1933. Psyche 40: 9. ♀.

**maculipennis** (Smith). Kans., Mo., Ark., Tex., Miss., Ala., Ga., N. C.

*Pompilus maculipennis* Smith, 1855. Cat. Hym. Brit. Mus., v. 3, p. 157. ♀.

**pyrrhomelas** (Walker). B. C., Wash., Oreg., Calif., Idaho, Nev., Utah, Ariz., N. Mex., commonest in Canad. Zone; Mexico. Prey: *Antrodiaetus pacificus* Simon.

*Pompilus pyrrhomelas* Walker, 1866. In Lord, Naturalist in Vancouver Isl. and B. C., v. 2, p. 341. ♀.

*Cryptocheilus rugosus* Banks, 1917. Mus. Compar. Zool., Bul. 61: 101. ♀.

*Cryptocheilus inaequalis* Banks, 1917. Mus. Compar. Zool., Bul. 61: 102. ♂.

Taxonomy: Bradley, 1944. Canad. Ent. 76: 132 (male description).

Biology: Krombein, 1958. U. S. Dept. Agr., Monog. 2, Sup. 1: 170 (prey).

**validus** (Cresson). N. C., S. C., Ga., Fla., Ala., in Lower Austral zone.

*Pompilus* (*Priocnemis*) *validus* Cresson, 1867. Amer. Ent. Soc., Trans. 1: 116. ♀.



Genus *PEPSIS* Fabricius

The species, commonly called tarantula hawks, are most frequently encountered at the flowers of various woody and suffrutescent plants of which the milkweed genus *Asclepias* appears to be the preferred floral host. So far as is known, all the species are predaceous on spiders of the family Theraphosidae (= Aviculariidae), most commonly on species of *Bothriocyrtum*, *Aphonopelma* and *Mygale*. The wasps may prepare a burrow before hunting for prey, or they may utilize the burrow of the tarantula itself as a nesting site.

*Pepsis* occurs only in the New World, and the majority of species are Neotropical.

Revision: Lucas, 1895 (1894). Berlin. Ent. Ztschr. 39: 449-839, pls. XXII-XXXIII (New World spp.). — Fox, 1898. Ent. Soc. Wash., Proc. 4: 140-148 (U. S. spp.). — Hurd, 1952. Amer. Mus. Nat. Hist., Bul. 98: 257-334, 49 figs., 2 tables (Nearctic spp., list of spp. in genus).

Taxonomy: Banks, 1921. Ent. Soc. Amer., Ann. 14: 22-23 (key to U. S. spp.).

Biology: Williams, 1956. Ent. Soc. Amer., Ann. 49: 447-466, 24 figs. (life history, prey, nesting behavior).

Morphology: Snodgrass, 1910. U. S. Natl. Mus., Proc. 39: figs. 61, 69 (lateral view of thorax and base of abdomen, base of forewing).

Genus *PEPSIS* Subgenus *PEPSIS* Fabricius

*Pepsis* Fabricius, 1804. Systema Piezatorum, pp. 207-208.

Type-species: *Sphex stellata* Fabricius. Desig. by Latreille, 1810.

**chrysothemis chrysothemis** Lucas. Tex. to Okla. w. into Calif.; Mexico (Sonora, Baja California). Prey: *Aphonopelma* sp.

*Pepsis chrysothemis* Lucas, 1894. Berlin. Ent. Ztschr. 39: 731, 739. ♂.

*Pepsis cinnabarina* Lucas, 1894. Berlin. Ent. Ztschr. 39: 782, 804. ♀.

*Pepsis circularis* Fox, 1898. Ent. Soc. Wash., Proc. 4: 142, 144. ♂.

Taxonomy: Hurd, 1952. Amer. Mus. Nat. Hist., Bul. 98: 312 (identity of *circularis*).

Biology: Williams, 1956. Ent. Soc. Amer., Ann. 49: 456 (prey, life history).

**chrysothemis lucasii** Fox. Tex.; Mexico (Tamaulipas).

*Pepsis Lucasii* Fox, 1898. Ent. Soc. Wash., Proc. 4: 141, 145. ♀.

**mexicana** Lucas. Tex. w. into south. Calif., s. to Colombia. Prey: *Aphonopelma* sp.

*Pepsis mexicana* Lucas, 1894. Berlin. Ent. Ztschr. 39: 560, 561, 566. ♂, ♀.

Taxonomy: Evans, 1959. Ent. Soc. Amer., Ann. 52: 431-432, fig. 41 (larva).

Biology: Williams, 1956. Ent. Soc. Amer., Ann. 49: 456, 458 (prey, life history).

**pallidolimbata pallidolimbata** Lucas. Tex. to Kans. w. into south. Calif.; Mexico (Coahuila, Chihuahua, Baja California).

*Pepsis pallidolimbata* Lucas, 1894. Berlin. Ent. Ztschr. 39: 733, 745. ♀.

*Pepsis bequaerti* Salman, 1928. Pan-Pacific Ent. 5: 23. ♂.

**pallidolimbata smithi** Hurd. Calif. (west-central flanks of Sierra Nevada and Mt. Diablo-Mt. Hamilton ranges). Prey: *Aphonopelma* sp.

*Pepsis pallidolimbata smithi* Hurd, 1948. Calif. Univ., Pubs., Ent. 8: 126, 142. ♂, ♀.

Biology: Williams, 1956. Ent. Soc. Amer., Ann. 49: 456 (prey, life history).

**thisbe** Lucas. Tex. to Nebr. w. into Calif.; Mexico (Coahuila, Chihuahua, Sonora, Baja California). Prey: *Aphonopelma* sp., *Avicularia californica* Bks.

*Pepsis thisbe* Lucas, 1894. Berlin. Ent. Ztschr. 39: 732, 733, 744. ♂, ♀.

*Pepsis sayi* Banks, 1926. Canad. Ent. 58: 202. ♂ (♀ misdet.).

*Pepsis sherillae* Hurd, 1948. Calif. Univ., Pubs., Ent. 8: 124, 146. ♂.

Taxonomy: Williams, 1956. Ent. Soc. Amer., Ann. 49: 457, figs. 10-13 (egg, larva). — Evans, 1959. Ent. Soc. Amer., Ann. 52: 431, figs. 1-7, 40 (larva).

Biology: Cockerell, 1916. Canad. Ent. 48: 55 (prey). — Williams, 1956. Ent. Soc. Amer., Ann. 49: 452-456, figs. 2, 9-14, 19, 21, 23-26 (prey, hunting behavior, life history).

Genus *PEPSIS* Subgenus *STENOPEPSIS* Banks

*Pepsis* subg. *Stenopepsis* Banks, 1945. Bol. Ent. Venezolana 4: 82.

Type-species: *Pepsis hymenaea* Mocsary. Orig. desig.

*venusta* Smith. South. Ariz. to Brazil.

*Pepsis venusta* Smith, 1855. Cat. Hym. Brit., Mus., v. 3, p. 196. ♂.

Genus *PEPSIS* Subgenus *DINOPEPSIS* Banks

*Pepsis* subg. *Dinopepsis* Banks, 1945. Bol. Ent. Venezolana 4: 83.

Type-species: *Pepsis grossa* Fabricius. Orig. desig.

*formosa formosa* (Say). Mo., Tex. to Kans. w. into Ariz. and Nev.; Mexico (Chihuahua). Prey:

*Aphonopelma chalcodes* Chamb., *Dugesilla* sp.

*Pompilus formosus* Say, 1832. West. Quart. Rptr. 2: 76. ♀.

*Pepsis nephele* Lucas, 1894. Berlin. Ent. Ztschr. 39: 732, 739. ♀.

*Pepsis pseudoformosa* Cockerell, 1898. Davenport Acad. Nat. Sci., Proc. 7: 146. ♂.

Biology: Buckley, 1862. Ent. Soc. Phila., Proc. 1: 138-139 (prey, misdet. as *Mygale*).

—Lincoecum, 1867. Amer. Nat. 1: 137-141, 2 figs. (prey, misdet. as *Mygale*). —Cazier and Mortenson, 1964. Ent. Soc. Amer., Ann. 57: 533-541, 8 figs. (prey, nesting behavior).

*formosa pattoni* Banks. N. Mex., Ariz., Calif.; Mexico (Sonora, Baja California).

*Pepsis pattoni* Banks, 1941. Mus. Compar. Zool., Bul. 94: 181. ♂, ♀.

Genus *PEPSIS* Subgenus *GIGANTOPEPSIS* Lucas

*Pepsis* subg. *Gigantopepsis* Lucas, 1919. Arch. f. Naturgesch., div. A 83: 10, 41.

Type-species: *Pepsis gigantea* Lucas. Orig. desig.

*aquila* Lucas. South. Ariz. and N. Mex.; Mexico (Durango).

*Pepsis aquila* Lucas, 1894. Berlin. Ent. Ztschr. 39: 797. ♂.

*arizonica* Banks. Tex., Ariz., Calif.; Mexico (Chihuahua, Durango).

*Pepsis arizonica* Banks, 1921. Ent. Soc. Amer., Ann. 14: 21. ♂.

*Pepsis hirsuta* Salman, 1933. Pan-Pacific Ent. 9: 9. ♀.

*marginata* Palisot de Beauvois. South. Fla.; West Indies. Prey: *Cyrtopholis portoricensis* Chamb.

*Pepsis marginata* Palisot de Beauvois, 1809. Ins. Afr., Amer., p. 94, pl. 2, figs. 2, 3. ♂, ♀.

*Pepsis heros* Dahlbom, 1843. Hym. Europaea, v. 1, p. 122. ♀.

Biology: Petrunkevitch, 1926. Jour. Expt. Zool. 45: 367-394, 2 pls. (prey, hunting behavior, nest, life history). —Petrunkevich, 1952. Sci. Amer. (for Aug.), pp. 20-23 (prey, hunting behavior, nest, life history).

Genus *PEPSIS* Subgenus *UNASSIGNED*

*angustimarginata* Viereck. Tex. to Kans. w. to south. Calif.; Mexico (Sonora, Chihuahua).

*Pepsis angustimarginata* Viereck, 1908 (1907). Amer. Ent. Soc., Trans. 33: 398. ♀.

*Pepsis sayi* Banks, 1926. Canad. Ent. 58: 202. ♀ (♂ misdet.).

*azteca* Cameron. Tex. south to Panama.

*Pepsis azteca* Cameron, 1893. Biol. Cent.-Amer., Hym., v. 2, p. 215. ♀.

*cerberus* Lucas. Kans., Tex., Ariz.; Mexico (Chihuahua, Baja California).

*Pepsis cerberus* Lucas, 1894. Berlin. Ent. Ztschr. 39: 780, 790. ♂.

*Pepsis inermis* Fox, 1898. Ent. Soc. Wash., Proc. 4: 141, 146. ♀.

*Pepsis novitia* Banks, 1921. Ent. Soc. Amer., Ann. 14: 21. ♂. Apparently a hybrid between *cerberus* and *elegans* Lep. with most characters as in *cerberus*.

Taxonomy: Hurd, 1952. Amer. Mus. Nat. Hist., Bul. 98: 295 (status of *novitia*).

*elegans* Lepeletier. Pa. to Kans., s. to Fla. and Tex. Ecology: Nests in rodent burrow. Prey: Huge spider.

*Pepsis elegans* Lepeletier, 1845. Hist. Nat. Ins. Hym., v. 3, p. 489. ♂.

*Pepsis dubitata* Cresson, 1867. Amer. Ent. Soc., Trans. 1: 144. ♂, ♀.

Biology: Rau and Rau, 1918. Wasp studies affield, pp. 67-71 (prey transport, nesting site).

Morphology: Salman, 1929. Amer. Ent. Soc., Trans. 55: 119-153, pls. VI-IX.

*mildei* Stal. Tex. to Kans. w. into Calif.; Mexico (Coahuila, Baja California). Ecology: Nests in prey burrow. Prey: *Bothriocyrtum californicum* (Camb.), *Aphonopelma* sp.

*Pepsis mildei* Stal, 1857. Ofvers. Kongl. Vetensk. Akad., Forh. 14: 64.

*Pepsis hesperia* Patton, 1894. Ent. Soc. Wash., Proc. 3: 46. ♂.

*Pepsis boquei* Fox, 1898. Ent. Soc. Wash., Proc. 4: 141, 142, 146. ♂, ♀.

Biology: Passmore, 1933. Natl. Geog. Mag., 64: 203, 205 (prey capture, nest). — Passmore, 1936. Nat. Mag. 27: 155-159 (prey capture, nest; misdet. as *formosa*). — Hurd, 1952. Amer. Mus. Nat. Hist., Bul. 98: 268 (prey). — Williams, 1956. Ent. Soc. Amer., Ann. 49: 458, 460, figs. 4-8, 15-19 (prey capture, nest, life history).

*saphirus* Palisot de Beauvois. South. Fla.; West Indies.

*Pepsis saphirus* Palisot de Beauvois, 1805. Ins. Afr., Amer., p. 39, pl. 1, fig. 4. ♀.

### Genus HEMIPEPSIS Dahlbom

*Hemipepsis* Dahlbom, 1844. Hym. Europaea, v. 1, p. 123.

Type-species: *Hemipepsis capensis* Dahlbom. Desig. by Ashmead, 1900.

*Pallosoma* Lepeletier, 1845. Hist. Nat. Ins. Hym., v. 3, p. 492.

Type-species: *Pallosoma barbara* Lepeletier. Desig. by Ashmead, 1900.

*Tetraodontonyx* Ashmead, 1900. Canad. Ent. 32: 187.

Type-species: *Tetraodontonyx rufipes* Ashmead. Orig. desig. (= *Pompilus heros* Guerin).

*Cryptocheilus* subg. *Tetracryptocheilus* Zavattari, 1907. R. Univ. Torino, Mus. Zool.

Compar. Anat., Bol. 22 (555): 4.

Type-species: *Cryptocheilus (Tetracryptocheilus) ascensi* Zavattari. Orig. desig.

*Tetracryptocheilus* Schulz, 1911. Zool. Ann. 4: 122. Emend.

*Trichonyx* Haupt, 1929. Rev. Zool. Bot. Africaines 17: 195.

Type-species: *Hemipepsis unguicularis* Kohl. Orig. desig.

*Pachynimia* Haupt, 1929. Rev. Zool. Bot. Africaines 17: 197, 202.

Type-species: *Prionemis tinctor* Saussure. Orig. desig.

*Hemipepsis* subg. *Xenopepsis* Arnold, 1932. Transvaal Mus., Ann. 14: 291, 323, 367.

Type-species: *Hemipepsis (Xenopepsis) commixta* Arnold. Orig. desig.

*Hemipepsis* subg. *Moropepsis* Banks, 1934. Amer. Acad. Arts and Sci., Proc. 69: 6, 8.

Type-species: *Hemipepsis (Moropepsis) croesus* Banks. Monotypic.

*Hovagenia* Banks, 1941. Acad. Nat. Sci. Phila., Proc. 92: 343.

Type-species: *Hovagenia saussurei* Banks. Orig. desig.

*mexicana* (Cresson). Tex. (Davis Mts.), s. to Panama.

*Mygimia mexicana* Cresson, 1867. Amer. Ent. Soc., Trans. 1: 143. ♀.

*toussainti* (Banks). Ariz., N. Mex.; Mexico (Durango, Michoacan, Mexico); Haiti.

*Mygimia toussainti* Banks, 1928. Studies on Cuban Insects, v. 1, p. 5. ♂.

*ustulata ochroptera* Stal. Cent. and south. Calif., Ariz., Nev., in U. Austr. and L. Austr. Zones.

Prey: *Brachythele longitarsis* Simon, *Aphonopelma* sp.

*Hemipepsis ochroptera* Stal, 1857. Ofvers. Svenska Vetensk. Akad., Forh. 14: 64.

*Mygimia hesperia* Banks, 1917. Mus. Compar. Zool., Bul. 61: 102. ♂, ♀.

Taxonomy: Evans, 1959. Ent. Soc. Amer., Ann. 52: 432-433, fig. 42 (larva).

Biology: Williams, 1956. Ent. Soc. Amer., Ann. 49: 460-462, figs. 20, 22 (prey capture, nest, life history).

*ustulata ustulata* Dahlbom. Tex., Okla., Kans., Colo., N. Mex., Utah, Ariz. in L. Austr. and U. Austr. Zones, less common in Transit. Zone; Mexico (Baja California, Durango, Michoacan, Hidalgo, Mexico).

*Hemipepsis ustulata* Dahlbom, 1843. Hym. Europaea, v. 1, p. 123. ♀.

*Mygimia cressoni* Banks, 1926. Canad. Ent. 58: 203. ♂, ♀.

### Genus PRIOCNESUS Banks

*Prionessus* Banks, 1925. Mus. Compar. Zool., Bul. 77: 337.

Type-species: *Salix neotropicalis* Cameron. Desig. by Pate, 1946.

*Cressochilus* Banks, 1941. *Canad. Ent.* 73: 119, 120.

Type-species: *Pompilus nuperus* Cresson. Orig. desig.

*Amerocnemis* Banks, 1945. *Bol. Ent. Venezolana* 4: 93.

Type-species: *Amerocnemis bequaerti* Banks. Orig. desig.

**apache** (Banks). *Tex., Ariz.* in *L. Austr. Zone*.

*Prioncnemis* (*Prioncnessus*) *apache* Banks, 1933. *Psyche* 40: 11. ♀.

**coloradensis** (Banks). *Colo., Tex.*

*Cryptocheilus coloradensis* Banks, 1910. *N. Y. Ent. Soc., Jour.* 18: 121. ♀.

**dakota** (Cresson). *Conn. and N. Y. to Ga., Kans., "Dakota"*.

*Pompilus* (*Agenia*) *Dakota* Cresson, 1867. *Amer. Ent. Soc., Trans.* 1: 124. ♂.

*Pompilus* (*Agenia*) *Dakota pallidicornis* Cresson, 1867. *Amer. Ent. Soc., Trans.* 1: 124. ♂.

**Preocc.**

*Prioncnemis* (*Prioncnessus*) *kiowa* Banks, 1933. *Psyche* 40: 12. ♀.

Taxonomy: Bradley, 1944. *Canad. Ent.* 76: 151-152 (female, male description, synonymy).

**nebulosus** (Dahlbom). *Ont., U. S. to 100° W. in Transit., U. Austr., and L. Austr. zones*.

Ecology: Occurs in open woods. Prey: *Agelenopsis potteri* (Blackw.), *A. emertoni* Chamb.

and Ivie, *A. pensylvanica* (Koch), *A. naevia* (Walck.), *A. sp.*

*Prioncnemis nebulosus* Dahlbom, 1843. *Hym. Europaea*, v. 1, p. 96. ♀.

*Pompilus* (*Agenia*) *pulchrinus* Cresson, 1867. *Amer. Ent. Soc., Trans.* 1: 126. ♂.

*Prioncnemis subconicus* Rohwer, 1911. *U. S. Natl. Mus., Proc.* 40: 556. ♀.

*Prioncnemis leiby* Brimley, 1928. *Elisha Mitchell Sci. Soc., Jour.* 43: 203. ♂.

Biology: Townes, 1957. *U. S. Natl. Mus., Bul.* 209: 43 (prey records). — Kurczewski, 1961.

*Brooklyn Ent. Soc., Bul.* 56: 23 (prey record). — Evans and Yoshimoto, 1962. *Ent. Soc.*

*Amer., Misc. Pub.* 3: 100-101 (ecology, prey records). — Kurczewski and Kurczewski, 1968.

*Kans. Ent. Soc., Jour.* 41: 3 (prey records).

**nigricans** Townes. *Ariz.*

*Prioncnessus nigricans* Townes, 1957. *U. S. Natl. Mus., Bul.* 209: 47. ♀.

**nuperus** (Cresson). *N. Y. to Ga., Kans., Tex. in U. and L. Austral zones*.

*Pompilus* (*Prioncnemis*) *nuperus* Cresson, 1867. *Amer. Ent. Soc., Trans.* 1: 118. ♀.

Taxonomy: Bradley, 1944. *Canad. Ent.* 76: 150-151 (male description).

### Genus ENTYPUS Dahlbom

*Entypus* Dahlbom, 1843. *Hym. Europaea*, v. 1, p. 35.

Type-species: *Entypus ochrocerus* Dahlbom. Monotypic.

*Prioncnemioides* Radoszkowski, 1888. *Soc. Imp. Nat. Moscou, Bul.* (n. s.) 2: 482.

Type-species: *Pompilus fulvicornis* Cresson. Desig. by Banks, 1944.

*Prionocnemoides* Dalla Torre, 1897. *Cat. Hym.*, v. 8, p. 211. Emend.

*Prioncnemioides* (!) Ashmead, 1900. *Canad. Ent.* 32: 187.

*Cheilotus* Bradley, 1946. *Soc. Cubana Hist. Nat., Mem.* 18: 124.

Type-species: *Pompilus ignipennis* Cresson. Orig. desig.

Taxonomy: Day, 1974. *Ent. News* 85: 92-94 (generic synonymy).

**angusticeps** (Townes), n. comb. *Tex.; Mexico (Sinaloa)*. Prey: *Lycosa antelucana* Mont.

*Prioncnemioides angusticeps* Townes, 1957. *U. S. Natl. Mus., Bul.* 209: 60, pl. 2, fig. 17. ♂, ♀.

**aratus** (Townes), n. comb. *Idaho, Utah, Ariz., N. Mex., Tex., Kans., in U. and L. Sonoran*

*Faunas; Mexico (Durango)*. Prey: *Lycosa carolinensis* Walck.

*Prioncnemioides aratus* Townes, 1957. *U. S. Natl. Mus., Bul.* 209: 51. ♀, ♂.

**austrinus** (Banks), n. comb. *Tex., Kans., Colo.*

*Cryptocheilus austrinus* Banks, 1917. *Mus. Compar. Zool., Bul.* 61: 102. ♀.

**austrinus fuscatus** (Townes), n. comb. *Ala., Kans.*

*Prioncnemioides austrinus fuscatus* Townes, 1957. *U. S. Natl. Mus., Bul.* 209: 53. ♀.

**fulvicornis** (Cresson). *Atlantic to 100° W. in U. Austr. and L. Austr. Zones*. Prey: *Lycosa avida* Walck.

*Pompilus* (*Prioncnemis*) *fulvicornis* Cresson, 1867. *Amer. Ent. Soc., Trans.* 1: 112. ♂, ♀.

- Biology: Townes, 1957. U. S. Natl. Mus., Bul. 209: 59 (prey record).  
**magnus** (Cresson), n. comb. Gulf and Atlantic States, Tex. to N. Y.  
*Pompilus (Priocnemis) magnus* Cresson, 1867. Amer. Ent. Soc., Trans. 1: 111. ♀.  
**texanus atripennis** (Townes), n. comb. La. (Opelousas).  
*Priocnemioides texanus atripennis* Townes, 1957. U. S. Natl. Mus., Bul. 209: 56. ♂.  
**texanus texanus** (Cresson), n. comb. Kans. to Tex., w. to Calif.; Mexico (Coahuila).  
*Priocnemis texanus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 204. ♂, ♀.  
**unifasciatus californicus** (Townes), n. comb. Calif.; Mexico (Baja California). Prey: *Lycosa pacifica* Bks.  
*Priocnemioides unifasciatus californicus* Townes, 1957. U. S. Natl. Mus., Bul. 209: 65, pl. 2, fig. 19. ♀, ♂.  
 Biology: Wasbauer and Powell, 1962. Kans. Ent. Soc., Jour. 35: 393 (prey).  
**unifasciatus cressoni** (Banks), n. comb. Kans. and Utah s. to Tex. and Ariz., s. to Guatemala.  
 Prey: *Lycosa antelucana* Mont.  
*Cryptocheilus cressoni* Banks, 1929. Psyche 36: 326. ♂, ♀.  
 Biology: Hurd and Wasbauer, 1956. Kans. Ent. Soc., Jour. 29: 169 (prey record).  
**unifasciatus unifasciatus** (Say), n. comb. Conn., N. Y. to Fla., w. to Wis., Ill., Kans. and Tex. in U. Austral Zone. Ecology: Occurs in open woods and overgrown fields. Prey: *Lycosa rabida* Walck., *L. riparia* Hentz.  
*Pompilus unifasciatus* Say, 1828. American Entomology 3: 92. ♀.  
 Biology: Townes, 1957. U. S. Natl. Mus., Bul. 209: 63 (ecology, prey record). —Evans and Yoshimoto, 1962. Ent. Soc. Amer., Misc. Pub. 3: 100 (prey record).  
 Morphology: Snodgrass, 1941. Smithsn. Inst., Misc. Collect. 99, no. 14: 46-47, pl. 16, figs. H-Q (male genitalia).

#### Genus CRYPTOCHEILUS Panzer

- Salius* Fabricius, 1804. Systema Piezatorum, p. 124. Preocc.  
 Type-species: *Sphex searpunctata* Fabricius. Desig. by Guerin, 1849.  
*Cryptocheilus* Panzer, 1806. Krit. Rev. Insektenf. Deutschlands, v. 2, p. 120.  
 Type-species: *Sphex annulata* Fabricius. Desig. by Westwood, 1840.  
*Cryptochilus* Rafinesque, 1815. Analyse de la Nature., p. 125. Emend.  
*Adonta* Billberg, 1820. Enum. Ins., p. 101. N. name for *Salius*.  
*Stenoclavelia* Arnold, 1932. Transvaal. Mus., Ann. 15: 44.  
 Type-species: *Stenoclavelia mirabilis* Arnold. Orig. desig.  
*Chilochares* Banks, 1941. Canad. Ent. 73: 119, 120.  
 Type-species: *Cryptocheilus birkmanni* Banks. Orig. desig.  
*Adirostes* Banks, 1946. Mus. Compar. Zool., Bul. 96: 465.  
 Type-species: *Adirostes tolteca* Banks. Orig. desig.  
**attenuatum** Banks. Tenn., La., Iowa, Kans., Tex., Colo.; Mexico (Morelos and Jalisco). Prey: *Lycosa antelucana* Mont., *L. avida* Walck., *L. near helluo* Walck., *L. sp.*; all prey records are of juvenile spiders.  
*Cryptocheilus attenuatum* Banks, 1933. Psyche 40: 8. ♂.  
 Biology: Townes, 1957. U. S. Natl. Mus., Bul. 209: 76 (prey record). —Kurzewski and Kurzewski, 1968. Kans. Ent. Soc., Jour. 41: 3 (prey records).  
**hesperus** (Banks). Oreg., Calif., Nev., Utah.  
*Priocnemis hesperus* Banks, 1915. Canad. Ent. 47: 401. ♀.  
*Cryptocheilus atratus* Banks, 1919. Mus. Compar. Zool., Bul. 63: 247. ♂, ♀.  
**idoneum birkmanni** Banks. 100° W. to Rocky Mts. in U. Austr. and L. Austr. Zones; also Ariz., N. Mex., and south. Calif.; Mexico (Baja California). Prey: *Lycosa tigana* Gertsch and Wallace, adult.  
*Cryptocheilus birkmanni* Banks, 1926. Canad. Ent. 58: 202 ♂, ♀.  
 Biology: Evans, 1959. Kans. Ent. Soc., Jour. 32: 75 (prey record).  
**idoneum idoneum** Banks. Va., N. C., Ga., Fla., Minn. Prey: *Lycosa impavida* Walck., juvenile.  
*Psammochares tenuicornis* Banks, 1910. Psyche 17: 249. ♂. Preoce.

*Cryptocheilus idoneus* Banks, 1910. *Psyche* 17: 250. ♀.

*Psammochares gracilicornis* Banks, 1912 (1911). *N. Y. Ent. Soc., Jour.* 19: 225. *N. name.*

Biology: Kurczewski, 1963. *Fla. Ent.* 46: 209 (prey transport).

**pallidipenne** (Banks). Oreg., Calif., Ariz., and N. Mex. in L. Sonor. Zone.

*Prionemoides* (!) *pallidipennis* Banks, 1912 (1911). *N. Y. Ent. Soc., Jour.* 19: 236. ♀.

**severini** Banks. 100° W. to Rocky Mts. in U. Austr. and L. Austr. Zones; also N. Mex., Ariz., and south. Calif.; Mexico (Durango, Chihuahua, Nuevo Leon).

*Cryptocheilus severini* Banks, 1926. *Canad. Ent.* 58: 202. ♂.

*Cryptocheilus arizonicus* Banks, 1933. *Psyche* 40: 7. ♀ (♂ misdet.).

**terminatum subopacum** (Cresson). Atlantic to 100° W. in U. Austr. Zone.

*Pompilus* (*Prionemis*) *subopacus* Cresson, 1867. *Amer. Ent. Soc., Trans.* 1: 114. ♂, ♀.

**terminatum terminatum** (Say). 100° W. to Rocky Mts. in U. Austr. Zone; Mexico (Zacatecas and Teotihuacan). Prey: *Lycosa* sp.

*Pompilus terminatus* Say, 1828. *American Entomology* v. 3, p. 92.

*Cryptocheilus carinatus* Banks, 1920. *Canad. Ent.* 58: 202. ♂.

Biology: Evans, 1970. *Mus. Compar. Zool., Bul.* 140: 480 (prey, nest).

### Genus PRIOCNEMIS Schiodte

So far as known all species are ground-nesting. Many species apparently do not dig a burrow from the ground surface, but construct a cell or cells off the side of a mammal burrow or a pre-existing crevice in the ground.

#### Genus PRIOCNEMIS Subgenus SPHICTOSTETHUS Kohl

*Sphictostethus* Kohl, 1885. *Zool.-Bot. Gesell. Wien, Verh.* 34: 37, 47.

Type-species: *Pompilus gravesii* Haliday. Orig. desig.

*Haploneura* Kohl, 1885. *Zool.-Bot. Gesell. Wien, Verh.* 34: 37, 47. Preocc.

Type-species: *Haploneura apogona* Kohl. Orig. desig.

*Haploneurion* Kohl, 1885. *Ent. Nachr.* 11: 163. *N. name.*

*Anapriocnemis* Haupt, 1959. *Nova Acta Leopoldina* 21, no. 141: 25-26.

Type-species: *Pompilus flavipes* Guerin. Orig. desig.

**pretiosa** Banks. Ariz., N. Mex. at 5,000 to 9,100 ft.; Mexico. Prey: *Lycosa* sp., juvenile.

*Prionemis pretiosa* Banks, 1933. *Psyche* 40: 13. ♂.

Biology: Townes, 1957. *U. S. Natl. Mus., Bul.* 209: 83 (prey record).

#### Genus PRIOCNEMIS Subgenus PRIOCNEMISSUS Haupt

*Prionemissus* Haupt, 1949. *Beitr. Tax. Zool.* 1: 75.

Type-species: *Prionemis coriaceus* Dahlbom, Orig. desig. Misspelled *coriarius* in orig. descr.

The North American species are all vernal.

**minorata** Banks. N. S., Que., Ont., U. S. east of 100th Meridian in Alleghanian and Carolinian Faunas, and in Transition Fauna in Pacific Northwest. Ecology: Occurs in woods and appears to dig its own burrow. Prey: *Coras juvenilis* (Keys.), *C. sp.*, *Wadotes calcaratus* (Keys.), *W. hybridus* (Em.), *W. sp.*; *Dolomedes tenebrosus* Hentz; *Arctosa rubicunda* (Keys.), *Lycosa gulosa* Walck., *L. sp.*, *Trochosa pratensis* (Em.); *Agroeca ornata* Bks., *Clubiona canadensis* Em., *C. obesa* Hentz., *C. spiralis* Em.; *Ayscha gracilis* (Hentz); *Amaurobius bennetti* (Blackw.).

*Prionemis minorata* Banks, 1912. *Canad. Ent.* 44: 197. ♀.

Taxonomy: Evans, 1959. *Ent. Soc. Amer., Ann.* 52: 434, figs. 8-13, 44 (larva).

Biology: Yoshimoto, 1954. *Brooklyn Ent. Soc., Bul.* 49: 130-138, 2 figs. (prey, nesting behavior). — Evans and Yoshimoto, 1962. *Ent. Soc. Amer., Misc. Pub.* 3: 99 (prey, nest).

— Kurczewski, 1963 (1962). *Brooklyn Ent. Soc., Bul.* 57: 86-87 (prey transport, nest).

— Kurczewski and Kurczewski, 1972. *Kans. Ent. Soc., Jour.* 45: 182-184 (prey records).

**nigripes** (Cresson). N. C., Tenn., Ark., Mo., Nebr., Kans.

*Pompilus (Priocnemis) nigripes* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 454. ♀.

*Priocnemis gomelza* Brimley, 1934. Ent. News 45: 43. ♀.

**oregona** Banks. B. C., Wash., Oreg., Calif., Idaho, Nev., Utah, Ariz. Prey: *Brachythele* sp.; *Actinoxia versicolor* Sim.; *Atypoides riversi* P.-Camb.

*Pompilus comparatus* Walker, 1866. In Lord, Naturalist in Vancouver Isl. and B. C., v. 2, p. 341. ♀. Preocc.

*Priocnemis oregona* Banks, 1933. Psyche 40: 11. N. name.

Biology: Hurd and Wasbauer, 1956. Kans. Ent. Soc., Jour. 29: 169 (prey record). — Wasbauer and Powell, 1962. Kans. Ent. Soc., Jour. 35: 394 (prey records).

### Genus PRIOCNEMIS Subgenus PRIOCNEMIS Schiodte

*Priocnemis* Schiodte, 1837. Kroyer's Naturhist. Tidsskr. 1: 324.

Type-species: *Spher exaltata* Fabricius. Desig. by Westwood, 1840.

*Prionocnemus* Burmeister, 1872. Stettin. Ent. Ztg. 33: 235. Emend.

*Prionocnemis* Kirby, 1884. Zool. Rec. 20, Ins., p. 131. Emend. Preocc.

*Myrmecosalius* Ashmead, 1903. Ent. Soc. Wash., Proc. 5: 307.

Type-species: *Myrmecosalius nigriceps* Ashmead. Monotypic.

**abbreviata** Townes. Tex. (Ft. Davis).

*Priocnemis (Priocnemis) abbreviatus* Townes, 1957. U. S. Natl. Mus., Bul. 209: 102. ♀.

**aequalis** (Banks). Transcont. in Canad. Zone and cooler parts of Transit. Zone.

*Ageniella aequalis* Banks, 1919. Mus. Compar. Zool., Bul. 63: 243. ♂.

**cornica** (Say). N. B., Ont., Man., transcontinental in U. S.; Mexico (Puebla, Durango). Ecology:

Occurs in open country, usually in sandy soil, but also in heavier soil. Prey: *Drassylus rufulus* Bks.; *Clubiona abbotti* Koch, *C. tibialis* Em., *C. sp.*, *Trachelas tranquillus* (Hentz); *Aysa gracilis* (Hentz), *A. sp.*; *Oxyopes salticus* Hentz; *Habronattus decorus* Black., *Evarcha hoyi* (Peckh.), *Zygoballus nervosus* Peckh., *Pellenes viridipes* (Hentz), *P. borealis* (Bks.), *P. spp.*, *Salticus scenicus* (Clerck); *Arctosa littoralis* Hentz, *Lycosa avida* Walck., *L. helluo* Walck., *L. spp.*, *Pardosa milvina* Hentz, *P. moesta* Bks., *P. saxatilis* (Hentz), *P. groenlandica* (Thor.), *P. spp.*, *Pirata arenicola* Em., *P. sedentaria* Montg., *P. sp.*, *Trochosa avara* Keys., *Sosippus floridanus* Sim., *Lycosidae* sp.

*Pompilus (Miscus) cornicus* Say, 1836. Boston Jour. Nat. Hist. 1: 305. ♀ (♂ misdet.).

*Pompilus (Miscus) conicus* Leconte, 1859. Writings of Thomas Say on Entomology, v. 2, p. 746. Emend.

*Pompilus (Priocnemis) pomilius* Cresson, 1867. Amer. Ent. Soc., Trans. 1: 116. ♀.

*Agenia atrata* Provancher, 1887. Addit. Corr. Faune Ent. Canad. Hym., p. 263. ♂, ♀.

*Salix pompilus* (!) Dalla Torre, 1897. Cat. Hym., v. 8, p. 237.

*Priocnemis pompilus* (!) Banks, 1919. Mus. Compar. Zool., Bul. 63: 245.

*Ageniella eximia* Banks, 1919. Canad. Ent. 51: 83. ♂.

*Ageniella aludra* Brimley, 1928. Elisha Mitchell Sci. Soc., Jour. 43: 201. ♂.

Taxonomy: Evans, 1959. Ent. Soc. Amer., Ann. 52: 434, fig. 38 (larva). — Townes, 1963. Ent. Soc. Wash., Proc. 65: 115 (synonymy of *atrata*).

Biology: Peckham, 1898. Wis. Geol. Nat. Hist. Survey, Bul. 2: 53-55 (prey capture). — Rau and Rau, 1918. Wasp studies afield, pp. 71-77, fig. 14 (prey, nest). — Evans and Yoshimoto, 1955. Kans. Ent. Soc., Jour. 28: 17 (prey). — Townes, 1959. U. S. Natl. Mus., Bul. 209: 200-201 (prey). — Evans and Yoshimoto, 1962. Ent. Soc. Amer., Misc. Pub. 3: 96-97 (prey, nesting behavior). — Kurczewski, 1961. Brooklyn Ent. Soc., Bul. 56: 23 (prey). — Kurczewski, 1963. Fla. Ent. 46: 210 (prey transport). — Kurczewski, 1963. Brooklyn Ent. Soc., Bul. 57: 87-88 (prey, nest). — Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 3-4 (prey records). — Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 368 (prey records). — Kurczewski and Kurczewski, 1972. Kans. Ent. Soc., Jour. 45: 184-185 (prey records).

**germana** (Cresson). Atlantic to 100° W. in Transit. and U. Austr. Zones, Colo., Ariz. Ecology:

Occurs in woods. Prey: *Agelenopsis utahana* (Chamb. and Ivie), *Coras* sp., prob.

- juvenilis* (Keys.), *Wadotes hybridus* (Em.), *W. sp.*; *Clubiona spiralis* Em.; *Aysha gracilis* (Hentz); *Maevia vittata* (Hentz); *Amaurobius bennetti* (Blackw.), *A. sp.*  
*Pompilus (Priocnemis) germanus* Cresson, 1867. Amer. Ent. Soc., Trans. 1: 116. ♀.  
*Pompilus (Agenia) iridipennis* Cresson, 1867. Amer. Ent. Soc., Trans. 1: 127. ♂.
- Biology: Evans and Yoshimoto, 1962. Ent. Soc. Amer., Misc. Pub. 3: 98 (hunting behavior, prey transport, nest ?). —Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 4 (prey records). —Kurczewski and Kurczewski, 1972. Kans. Ent. Soc., Jour. 45: 185-186 (prey records).
- hestia** (Banks). N. H. to Va., W. Va. Ecology: Occurs in woods. Prey: *Agroeca* sp.  
*Ageniella hestia* Banks, 1915. Canad. Ent. 47: 400. ♂.  
*Ageniella crassicornis* Banks, 1917. Mus. Compar. Zool., Bul. 61: 108. ♂.
- Biology: Evans and Yoshimoto, 1962. Ent. Soc. Amer., Misc. Pub. 3: 98 (prey hunting, transport, nest ?).
- minuscule** (Banks). N. C., S. C., Tex., Kans., Ill.  
*Ageniella minuscule* Banks, 1917. Mus. Compar. Zool., Bul. 61: 110. ♂.
- nigriceps** (Ashmead). Iowa, Kans., Tex.  
*Myrmecosalus nigriceps* Ashmead, 1903. Ent. Soc. Wash., Proc. 5: 308. ♀.
- notha alaskensis** Townes. Alaska, N. W. T. Prey: *Paraphidippus marginatus* (Walck.).  
*Priocnemis (Priocnemis) notha alaskensis* Townes, 1957. U. S. Natl. Mus., Bul. 209: 106. ♂, ♀.
- Biology: Townes, 1957. U. S. Natl. Mus., Bul. 209: 106 (prey).
- notha navajo** Banks. B. C., Oreg., Calif., Ariz., N. Mex.; Transit. and Canad. Zones; Mexico.  
*Priocnemis navajo* Banks, 1933. Psyche 40: 15. ♀.
- notha notha** (Cresson). P. E. I., N. B., Que., Ont., Man., in U. S. from Atlantic to Rocky Mts. in Canad., Transit., and U. Austr. Zones. Ecology: Occurs in open country. Prey: *Trochosa pratensis* Em., *Schizocosa crassipes* (Walck.), *S. sp.*, *Clubiona* sp.  
*Pompilus (Priocnemis) nothus* Cresson, 1867. Amer. Ent. Soc., Trans. 1: 118. ♀.  
*Cryptocheilus paeneparcus* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 202. ♀.
- Biology: Evans and Yoshimoto, 1962. Ent. Soc. Amer., Misc. Pub. 3: 97-98 (prey transport, nest). —Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 4-5 (prey transport). —Kurczewski and Kurczewski, 1972. Kans. Ent. Soc., Jour. 45: 186 (prey).
- notha occidentis** Banks. Oreg., Wash., Calif.; in Transit. and Canad. Zones.  
*Priocnemis occidentis* Banks, 1944. Mus. Compar. Zool., Bul. 94: 172. ♀.
- scitula relictus** Banks. Que., Ont. to N. C., W. Va., Ohio, Wis. Ecology: Occurs in bottomland woods. Prey: *Habrocestum pulex* (Hentz), *Maevia vittata* (Hentz); *Agelenopsis* sp.; *Agroeca* sp., *Clubiona kastoni* Gertsch, *C. spiralis* Em., *C. spp.*; *Xysticus* sp.; *Amaurobius bennetti* (Blackw.).  
*Priocnemis relictus* Banks, 1912. Canad. Ent. 44: 198. ♀.  
*Ageniella tenella* Banks, 1915. Canad. Ent. 47: 400. ♂.
- Biology: Krombein, 1961. Brooklyn Ent. Soc., Bul. 56: 62 (prey transport). —Evans and Yoshimoto, 1962. Ent. Soc. Amer., Misc. Pub. 3: 98-99 (prey transport, nest). —Kurczewski and Kurczewski, 1972. Kans. Ent. Soc., Jour. 45: 186-187 (prey).
- scitula scitula** (Cresson). Atlantic to 100° W. in U. Austr. Zone. Ecology: Bottomland woods.  
*Pompilus (Priocnemis) scitulus* Cresson, 1867. Amer. Ent. Soc., Trans. 1: 118. ♀.  
*Agenia perfecta* Provancher, 1882. Nat. Canad. 13: 44. ♂.
- Taxonomy: Townes, 1963. Ent. Soc. Wash., Proc. 65: 115 (synonymy of *perfecta*).

#### Genus CALICURGUS Lepeletier,

*Calicurgus* Lepeletier, 1845. Hist. Nat. Ins. Hym., v. 3, p. 397.

Type-species: *Pompilus fasciatellus* Spinola. Desig. by Kohl, 1884 (= *Sphex hyalinatus* Fabricius).

*Caliadurgus* Pate, 1946. Amer. Ent. Soc., Trans. 72: 78.

Type-species: *Sphex hyalinatus* Fabricius. Orig. desig.



- hyalinatus alienatus** (Smith). Atlantic to 100° W. in Transit. and U. Austr. Zones. Ecology: Occurs along stream and river bottoms; nests in sand and heavier soil. Prey: *Araneus marmoreus* Clerck., *A. patagiatus* Clerck., *A. spp.*, *Araniella displicata* (Hentz), *Neoscona* spp., *Wixia ectypa* (Walck.), *Eustala anastera* (Walck.), *Acanthepeira stellata* (Walck.), *Araneinae* sp. *C. hyalinata hyalinata* (Fabricius) occurs in Europe.
- Pompilus fasciipennis* Say, 1824. In Keating, Narr. Long's 2nd Exped., v. 2, app. p. 332. ♀. Preocc.
- Pompilus alienatus* Smith, 1855. Cat. Hym. Brit. Mus., v. 3, p. 159. N. name.
- Pompilus (Agenia) calcaratus* Cresson, 1867. Amer. Ent. Soc., Trans. 1: 128. ♂.
- Salix fasciipennis* Dalla Torre, 1897. Cat. Hym., v. 8, p. 223. Emend.

Biology: Evans and Yoshimoto, 1955. Kans. Ent. Soc., Jour. 28: 17 (prey). — Townes, 1957. U. S. Natl. Mus., Bul. 209: 113 (prey). — Krombein, 1958. Biol. Soc. Wash., Proc. 71: 21 (prey transport). — Krombein, 1958. Ent. Soc. Wash., Proc. 60: 52-53 (prey). — Krombein, 1961. Brooklyn Ent. Soc., Bul. 56: 62 (prey). — Evans and Yoshimoto, 1962. Ent. Soc. Amer., Misc. Pub. 3: 101 (prey transport, nest). — Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 5 (prey and transport). — Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 368 (prey and capture). — Kurczewski and Kurczewski, 1972. Kans. Ent. Soc., Jour. 45: 187 (prey and transport).

**hyalinatus borealis** (Banks). Transcont. in Canad. Zone.

*Prionemys alienatus borealis* Banks, 1933. Psyche 40: 10. ♀.

**hyalinatus excoctus** Townes. N. Mex. Ariz.; Mexico (Morelos, Durango, Jalisco).

*Calicurgus hyalinatus excoctus* Townes, 1957. U. S. Natl. Mus., Bul. 209: 115. ♀, ♂.

**hyalinatus ruxep** (Cresson). Md., N. C., Ga., Kans., Tex., mostly in Austroriparian Fauna; Mexico (Puebla).

*Pompilus (Prionemys) ruxep* Cresson, 1869. Boston Soc. Nat. Hist., Proc. 12: 372. ♀.

*Pompilus (Agenia) accolens* Cresson, 1869. Boston Soc. Nat. Hist., Proc. 12: 374. ♂.

*Salix ruxep* (!) Dalla Torre, 1897. Cat. Hym., v. 8, p. 239.

### Genus DIPOGON Fox

Our species are most commonly found in wooded areas. The North American species for which the nesting habits are known all use pre-existing cavities in wood as a nesting site. The nest consists of a linear series of cells usually separated by complex partitions of debris such as bits of wood or leaf, dead insects, caterpillar frass with an outer layer of compacted soil. Errant spiders are used as prey.

Revision: Evans, 1974. Amer. Ent. Soc., Trans. 100: 29-51, 23 figs. (spp. of southwestern U. S., Mexico, Central America).

### Genus DIPOGON Subgenus DEUTERAGENIA Susterá

*Agenia* Schiodte, 1837. Kroyer's Naturhist. Tidsskr. 1: 321. Preocc.

Type-species: *Sphex variegata* Linnaeus. Desig. by Westwood, 1840.

*Pogonius* Dahlbom, 1845. Hym. Europaea, v. 1, p. 453. Preocc.

Type-species: *Sphex variegata* Linnaeus. Desig. by Pate, 1946.

*Deuteragenia* Susterá, 1913. Zool.-Bot. Gesell. Wien, Verh. 16: 191. N. name for *Agenia*.

*Dipogon* subg. *Adipogon* Banks, 1944. Mus. Compar. Zool., Bul. 94: 181.

Type-species: *Pompilus pulchripennis* Cresson. Orig. desig.

**calipterus calipterus** (Say). Mass. to N. C., Ind., Ill. Prey: *Amaurobius* sp.

*Pompilus calipterus* Say, 1836. Boston Jour. Nat. Hist. 1: 302. ♀.

*Deuteragenia pilosa* Banks, 1933. Psyche 40: 16. ♀.

*Dipogon femur-aureus* Dreisbach, 1953. Amer. Midland Nat. 49: 832. ♀.

Biology: Wasbauer and Powell, 1962. Kans. Ent. Soc., Jour. 35: 394 (prey).

**calipterus duplicatus** Townes. Fla., Ga.

*Dipogon (Deuteragenia) calipterus duplicatus* Townes, 1957. U. S. Natl. Mus., Bul. 209: 125. ♀.

**calipterus nubifer** (Cresson). Calif. s. to Panama. Ecology: Nests in hollow stems. Prey:

*Gnaphosa* sp.; *Misumena* sp.; *Trachelas pacificus* Chamb. and Ivie.

*Pompilus (Agenia) nubifer* Cresson, 1869. Boston Soc. Nat. Hist., Proc. 12: 374. ♀.

*Pseudagenia isthmica* Cameron, 1891. Biol. Cent.-Amer., Hym. 2: 165, pl. 10, fig. 11. ♀.

*Pseudagenia isthmia*(!) Dalla Torre, 1897. Cat. Hym., v. 8, p. 204.

Taxonomy: Wasbauer, 1960. Pan-Pacific Ent. 36: 174, figs. 4-6. ♂. — Evans, 1974. Amer. Ent. Soc., Trans. 100: 36, fig. 19. ♀, ♂.

Biology: Williams, 1966. Amer. Midland Nat. 24: 33-47 (prey, nest, life history). — Parker and Bohart, 1966. Pan-Pacific Ent. 42: 94 (nest).

**geronimo** Evans. Southeastern Ariz.

*Dipogon (Deuteragenia) geronimo* Evans, 1974. Amer. Ent. Soc., Trans. 100: 37, figs. 4, 7, 17, 18. ♀, ♂.

**hurdi** Evans. Southeastern Ariz.; Mexico (Durango). Prey: *Icius* sp.

*Dipogon (Deuteragenia) hurdi* Evans, 1974. Amer. Ent. Soc., Trans. 100: 41, figs. 5, 21. ♀, ♂.

Biology: Evans, 1974. Amer. Ent. Soc., Trans. 100: 41 (prey).

**iracundus** Townes. Ariz.; Mexico (Durango). Ecology: Nests in borings in wood.

*Dipogon (Deuteragenia) iracundus* Townes, 1957. U. S. Natl. Mus., Bul. 209: 127. ♀.

Taxonomy: Evans, 1974. Amer. Ent. Soc., Trans. 100: 40-41. ♀, ♂.

Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 168-169 (nest, life history).

**melanocephalus** (Cameron). Tex. (Hidalgo Co.); Mexico (Veracruz, Oaxaca, Morelos).

*Pseudagenia melanocephala* Cameron, 1891. Biol. Cent.-Amer., Hym., v. 2, p. 172, pl. 10, fig. 18. ♀.

Taxonomy: Evans, 1974. Amer. Ent. Soc., Trans. 100: 43-45, figs. 3, 8, 15, 22. ♀, ♂.

**papago anomalus** Dreisbach. Canad., Transit. and U. Austr. Zone from Atlantic to 100° W.

Ecology: Nests in borings in wood. Prey: *Paraphidippus aurantius* (Luc.), *Phidippus* sp.; *Sergiolus variegatus* (Hentz), *Haplodrassus hiemalis* (Em.), *Poecilochroa capulata* (Walck.); *Clubiona canadensis* Em.

*Dipogon anomalus* Dreisbach, 1953. Amer. Midland Nat. 49: 834, figs. 4, 8. ♂.

Taxonomy: Evans, 1959. Ent. Soc. Amer., Ann. 52: 436 (larva).

Biology: Townes, 1957. U. S. Natl. Mus., Bul. 209: 122 (prey, nest). — Evans and Yoshimoto, 1962. Ent. Soc. Amer., Misc. Pub. 3: 104-105 (prey transport, nest). — Krombein, 1967.

Trap-nesting wasps and bees, pp. 167-168 (prey, nest, life history). — Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 368 (prey).

**papago floridanus** Townes. Fla.

*Dipogon (Deuteragenia) papago floridanus* Townes, 1957. U. S. Natl. Mus., Bul. 209: 122. ♀, ♂.

**papago papago** (Banks). B. C., Ariz., Tex.; Mexico (Morelos).

*Deuteragenia papago* Banks, 1943. Psyche 40: 17. ♀.

**pulchripennis** (Cresson). Atlantic to 100° W., mostly in Canad. and Transit. Zones; also Ariz.

(9,000 ft. in Santa Catalina Mts.); Mexico (Durango). Prey: *Xysticus* sp.; *Amaurobius bennetti* (Blackw.); *Phidippus audax* (Hentz).

*Pompilus (Agenia) pulchripennis* Cresson, 1867. Amer. Ent. Soc., Trans. 1: 123. ♂, ♀.

Biology: Kurczewski and Kurczewski, 1972. Kans. Ent. Soc., Jour. 45: 188 (prey).

**sayi nigrior** Townes. Transit. Fauna, B. C., Oreg., Calif., Mont., Colo., N. Mex. Prey: *Xysticus* sp.

*Dipogon (Deuteragenia) sayi nigrior* Townes, 1957. U. S. Natl. Mus., Bul. 209: 130. ♀.

Biology: Townes, 1957. U. S. Natl. Mus., Bul. 209: 131 (prey).

**sayi sayi** Banks. Atlantic to 100° W. in Transit. and U. Austr. Zones. Ecology: Nests in

borings in wood. Parasite: *Anthrax irroratus* Say; *Melittobia chalybii* Ashm.,

*Tetrastichus johnsoni* Ashm.; *Ephuta p. pauxilla* Brad. Prey: *Xysticus bicuspis* Keys.,

*X. elegans* Keys., *X. ferox* (Hentz), *X. peltax* Camb., *X. triguttatus* Keys., *X. fraternus* Bks., *X. funestus* Keys., *X. canadensis* Gertsch, *X. discursans* Keys., *X. obscurans* Coll., *X. punctatus* (Keys.), *X. luteiventris* Gertsch, *X. spp.*, *Misumena vatia* (Clerck), *Misumenoides formosipes* (Walck.), *Tmarus angulatus* (Walck.), *Coriarachne versicolor* Keys., *C. utahensis* Gertsch; *Agelenopsis utahana* (Chamb. and Ivie); *Phidippus whitmanii* Peckh.; *Nodocion melanie* Levi, *Poecilochroa capulata* (Walck.), *P. montana* Em.; *Amaurobius bennetti* (Blackw.), *A. sp.*

*Dipogon sayi* Banks, 1941. Canad. Ent. 73: 122. ♂, ♀.

*Deuteragenia fascipennis* Haupt, 1959. Nova Acta Leopoldina 21, no 141: 32, fig. 16. ♀.

Taxonomy: Evans, 1959. Ent. Soc. Amer., Ann. 52: 436, figs. 14-19, 45 (larva). — Evans, 1974. Amer. Ent. Soc., Trans. 100: 30 (synonymy).

Biology: Peckham, 1898. Wis. Geol. Nat. Hist. Survey, Bul. 2: 144 (prey, nest; misdet. as *calipterus*). — Townes, 1957. U. S. Natl. Mus., Bul. 209: 130 (nest). — Medler and Koerber, 1957. Ent. Soc. Amer., Ann. 50: 621-625, 6 figs. (nest, prey, life history, parasite). — Krombein, 1958. Ent. Soc. Wash., Proc. 60: 52 (prey). — Evans and Yoshimoto, 1962. Ent. Soc. Amer., Misc. Pub. 3: 102-104 (nest, prey, life history, parasites). — Fye, 1965. Canad. Ent. 97: 735-736 (nest, prey, life history). — Krombein, 1967. Trap-nesting wasps and bees, pp. 161-167, pl. 10, figs. 46 (?), 47 (?), 48 (nest, prey, life history, parasites). — Kurczewski and Kurczewski, 1972. Kans. Ent. Soc., Jour. 45: 188 (prey).

*sericeus* Banks. Oreg., Calif.

*Dipogon sericea* Banks, 1944. Mus. Compar. Zool., Bul. 94: 180. ♀.

*thoracicus* Townes. N. Mex., Ariz.; Mexico (Sinaloa, Durango, Morelos). Prey: *Xysticus* spp., juv.

*Dipogon (Deuteragenia) thoracicus* Townes, 1957. U. S. Natl. Mus., Bul. 209: 126. ♀.

Biology: Evans, 1974. Amer. Ent. Soc., Trans. 100: 40 (prey).

### Genus DIPOGON Subgenus DIPOGON Fox

*Dipogon* Fox, 1897. Acad. Nat. Sci. Phila., Proc., p. 241.

Type-species: *Dipogon populator* Fox. Orig. desig.

*Agriogenia* Banks, 1919. Canad. Ent. 51: 83.

Type-species: *Pompilus brevis* Cresson. Orig. desig.

*brevis brevis* (Cresson). Carol. Fauna, Mass. to N. C. Prey: *Phidippus purpuratus* Keys., *Pellenes hoyi* (Peckh.), *P. sp.*

*Pompilus (Agenia) brevis* Cresson, 1867. Amer. Ent. Soc., Trans. 1: 123. ♂.

Biology: Evans and Yoshimoto, 1962. Ent. Soc. Amer., Misc. Pub. 3: 105 (prey transport). — Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 5 (prey).

*brevis ochreus* Townes. Md., S. C. Prey: *Phidippus* (?) sp., juv.

*Dipogon (Dipogon) brevis ochreus* Townes, 1957. U. S. Natl. Mus., Bul. 209: 137. ♀.

Biology: Townes, 1957. U. S. Natl. Mus., Bul. 209: 137 (prey).

*brevis recalvus* Townes. Alleghan. Fauna, Que. and Ont. to Va. and Wis.

*Dipogon (Dipogon) brevis recalvus* Townes, 1957. U. S. Natl. Mus., Bul. 209: 134. ♀, ♂.

*diablo* Wasbauer. Calif. (Contra Costa Co.).

*Dipogon (Dipogon) diablo* Wasbauer, 1960. Pan-Pacific Ent. 36: 172, figs. 1-3. ♀, ♂.

*graeicheri atratus* Townes. N. J., N. C.

*Dipogon (Dipogon) graeicheri atratus* Townes, 1957. U. S. Natl. Mus., Bul. 209: 139, pl. 2, fig. 29. ♀.

*graeicheri graeicheri* Banks. Fla., La.

*Dipogon graeicheri* Banks, 1939. Canad. Ent. 71: 230. ♀.

*leechi* Wasbauer. Calif. (Marin Co.); Mexico (Baja California).

*Dipogon (Dipogon) leechi* Wasbauer, 1960. Pan-Pacific Ent. 36: 171. ♀.

*paludis* Townes. N. J. (Atsion).

*Dipogon (Dipogon) paludis* Townes, 1957. U. S. Natl. Mus., Bul. 209: 133. ♀.

*parkeri* Wasbauer. Nev. (Washoe Co.). Ecology: Nests in borings in *Sambucus* stems.

*Dipogon (Dipogon) parkeri* Wasbauer, 1966. Biol. Soc. Wash., Proc. 79: 17. ♀, ♂.

Biology: Parker and Bohart, 1966. Pan-Pacific Ent. 42: 94 (nest).  
*pygmaeus* Townes. Ala. (Prattsville).

*Dipogon (Dipogon) pygmaeus* Townes, 1957. U. S. Natl. Mus., Bul. 209: 132. ♀.  
*texasus texanus* Banks. Tex. (Brownsville). Another subspecies occurs in Mexico.  
*Dipogon texanus* Banks, 1944. Mus. Compar. Zool., Bul. 94: 179. ♀.

#### Genus **DIPOGON** Subgenus **WINNEMANELLA** Krombein

*Dipogon* subg. *Winnemanella* Krombein, 1962. Biol. Soc. Wash., Proc. 75: 7.

Type-species: *Dipogon (Winnemanella) fulleri* Krombein. Orig. desig.  
*fulleri* Krombein. Md., S. C. Prey: *Icius hartii* Em.

*Dipogon (Winnemanella) fulleri* Krombein, 1962. Biol. Soc. Wash., Proc. 75: 8. ♀.

Biology: Krombein, 1962. Biol. Soc. Wash., Proc. 75: 8 (prey).

#### TRIBE AUPLOPODINI

Members of this tribe usually amputate one or more of the spider's legs, presumably to facilitate prey transport, although there are records of some wasps feeding on body fluids exuding from the severed leg stumps. *Phanagenia* and *Auplopus* are mud-daubers, constructing mud cells in sheltered situations. A few species of *Ageniella* have been recorded as nesting in the ground, either in pre-existing crevices or in burrows which they dig themselves. The nesting habits of *Priocnemella* are unknown, but the lack of a pygidial area in the female suggests that it is not a mud-dauber.

#### Genus **PHANAGENIA** Banks

*Phanagenia* Banks, 1933. Psyche 40: 18.

Type-species: *Phanagenia osceola* Banks. Orig. desig. (= *Pompilus bombycinus* Cresson).

Only the type-species occurs in the New World. At least two other species occur in Africa.

*bombycina* (Cresson). Atlantic to 100° W. in U. Austr. and L. Austr. Zones, also N. Mex.

Ecology: Builds mud cells beneath loose bark and under stones. Parasite: *Ceropales robinsonii* Cr.; *Ephuta scrupea* (Say). Prey: *Lycosa avida* Walck., *L. gulosa* Walck., *Lycosidae* sp.; *Maevia vittata* (Hentz); *Agelenopsis* sp.

*Pompilus (Agenia) bombycinus* Cresson, 1867. Amer. Ent. Soc., Trans. 1: 125. ♂, ♀.

*Ageniella annexa* Banks, 1912 (1911). N. Y. Ent. Soc., Jour. 19: 233. ♀.

*Phanagenia osceola* Banks, 1933. Psyche 40: 18. ♀.

Biology: Walsh and Riley, 1869. Amer. Ent. 1: 131-132, 136, 163 (nest, parasite). —Peckham and Peckham, 1898. Wis. Geol. Nat. Hist. Survey, Bul. 2: 164-165 (nest, prey, life history).

—Peckham and Peckham, 1905. Wasps social and solitary, pp. 244-247 (nest, life history, prey). —Savin, 1924. Nat. Hist. 24: 520-522 (nest, prey). —Schuster, 1951. N. Y. Ent. Soc., Jour. 59: 34 (parasite). —Townes, 1957. U. S. Natl. Mus., Bul. 209: 143 (nest, prey).

—Kurzewski, 1961. Brooklyn Ent. Soc., Bul. 56: 23 (prey transport). —Evans and Yoshimoto, 1962. Ent. Soc. Amer., Misc. Pub. 3: 108 (prey transport). —Kurzewski and Kurzewski, 1968. Kans. Ent. Soc., Jour. 41: 5 (prey).

#### Genus **AUPLOPUS** Spinola

*Auplopus* Spinola, 1841. Soc. Ent. France, Ann. 10: 108.

Type-species: *Pompilus femoratus* Fabricius. Monotypic.

*Aoplopus* Agassiz, 1846. Nomencl. Zool., Index Univ., pp. 27, 41. Emend.

*Pilpomus* Costa, 1859. Fauna Regno Napoli, Imenotteri Aculeati, Pompilidea, p. 3.

Type-species: *Sphex carbonarius* Scopoli. Desig. by Pate, 1946.

*Pseudagenia* Kohl, 1885. Zool.-Bot. Gesell. Wien, Verh. 34: 38, 42.

Type-species: *Sphex carbonarius* Scopoli. Orig. desig.

*Tumagenia* Banks, 1934. Amer. Acad. Arts and Sci., Proc. 69: 39, 67.

Type-species: *Tumagenia iris* Banks. Monotypic.

*Calagenia* Banks, 1934. Amer. Acad. Arts and Sci., Proc. 69: 40, 72.

Type-species: *Calagenia hermosa* Banks. Orig. desig.

*Lophagenia* Banks, 1934. Amer. Acad. Arts and Sci., Proc. 69: 40, 74.

Type-species: *Pseudagenia erigone* Bingham. Orig. desig.

The genera *Stenagenia* Saussure, 1892, and *Schizagenia* Cameron, 1910, are questionable synonyms.

Members of this genus make mud cell nests under stones, under logs, and in other protected places.

**adjunctus** (Banks). Md. to Fla., west to Tex. Ecology: Reared from mud cell; occurs in damp bottomland woods. Prey: *Chiracanthium inclusum* (Hentz); *Phidippus rimator* (Walck.).

*Pseudagenia mellipes* var. *adjuncta* Banks, 1911. Ent. Soc. Wash., Proc. 13: 238.

*Pseudagenia marionae* Brimley, 1928. Elisha Mitchell Sci. Soc., Jour. 43: 202. ♂.

Taxonomy: Banks, 1912 (1911). N. Y. Ent. Soc. Jour. 19: 233. ♀.

Biology: Townes, 1957. U. S. Natl. Mus., Bul. 209: 151 (nest). —Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 6 (prey).

**architectus architectus** (Say). Transit. to Austrorip. Zones from Atlantic to Rocky Mts., and west of Rocky Mts. in Colo., N. Mex. and Ariz.; Mexico (Durango, Zacatecas, Puebla).

Ecology: Builds mud cells under loose bark, under stones, and in abandoned burrows of ground-nesting bees. Parasite: *Sphaerophthalma pensylvanica saeva* (Bl.). Prey:

*Trachelas tranquillus* (Hentz), *Clubiona* sp.; *Phidippus princeps* (Peckh.), *P. audax* (Hentz), *P. sp.* near *whitmannii* Peckh., *Icius similis* Bks.; *Misumenops oblongus* (Keys.).

*Pompilus architectus* Say, 1836. Boston Jour. Nat. Hist. 1: 303. ♀.

Taxonomy: Walsh, 1869. Amer. Ent. 1: 163.

Biology: Say, 1836. Boston Jour. Nat. Hist. 1: 303 (nest). —Walsh and Riley, 1869. Amer.

Ent. 1: 132, 163 (nest). —Rau and Rau, 1918. Wasp studies afield, pp. 83-84, fig. 16 (nest).

—Krombein, 1955. Brooklyn Ent. Soc., Bul. 50: 14-15 (prey transport). —Townes, 1957. U.

S. Natl. Mus., Bul. 209: 164-165 (nest, prey). —Kurczewski, 1961. Brooklyn Ent. Soc., Bul.

56: 24 (prey transport). —Krombein, 1961. Brooklyn Ent. Soc., Bul. 56: 62-63 (prey).

—Evans and Yoshimoto, 1962. Ent. Soc. Amer., Misc. Pub. 3: 108-109 (nest, prey).

—Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 6 (prey transport).

**architectus metallicus** (Banks). West of Rocky Mts., from B. C. to north Mexico. Parasite: *Sphaerophthalma difficilis* (Bak.). Prey: *Thiodina* sp., *Phidippus formosus* Peckh. and Peckh.; *Trachelas pacificus* Chamb. and Ivie.

*Pseudagenia metallica* Banks, 1910. N. Y. Ent. Soc., Jour. 18: 125. ♀.

Biology: Hurd and Wasbauer, 1956. Kans. Ent. Soc., Jour. 29: 169 (prey). —Evans and Yoshimoto, 1962. Ent. Soc. Amer., Misc. Pub. 3: 109 (prey).

**caerulescens caerulescens** (Dahlbom). Md. to S. C., Kans., Tex.

*Agenia caerulescens* Dahlbom, 1843. Hym. Europaea, v. 1, p. 93. ♀.

*Pseudagenia caerulescens* (!) Banks, 1912 (1911). N. Y. Ent. Soc., Jour. 19: 232. ♂, ♀.

**caerulescens floridanus** (Banks). Austrorip. Fauna, Fla. to S. C.

*Pseudagenia floridana* Banks, 1921. Ent. Soc. Amer., Ann. 14: 21. ♀.

**caerulescens subcorticalis** (Walsh). Atlantic to 100° W. in Transit., U. Austr., and L. Austr.

Zones, though replaced in parts of its range by the subspecies *antennalis* and *caerulescens*; Mexico (Guayamas). Ecology: Makes mud cells beneath loose bark and in borings in wood; occurs in woods. Prey: *Trachelas tranquillus* (Hentz), *Clubiona obesa* Hentz, C. sp.; *Phidippus audax* (Hentz); *Anyphaena pectorosa* Koch.

*Agenia subcorticalis* Walsh, 1869. Amer. Ent. 1: 162. ♂, ♀.

*Pseudagenia antennalis* Banks, 1910. Psyche 17: 251. ♀.

*Pseudagenia ariella* Banks, 1941. Canad. Ent. 73: 122. ♀.

Biology: Walsh and Riley, 1869. Amer. Ent. 1: 131-132 (nest). —Evans and Yoshimoto, 1955.

Kans. Ent. Soc., Jour. 28: 17 (prey). —Townes, 1957. U. S. Natl. Mus., Bul. 209: 159 (nest).

—Evans and Yoshimoto, 1962. Ent. Soc. Amer., Misc. Pub. 3: 109-110 (prey transport).

—Medler, 1964. Ent. News 75: 190-191 (nest, prey, life history). —Krombein, 1967.

Trap-nesting wasps and bees, pp. 170-171, pl. 9, figs. 42-44 (nest, prey, life history).

**flavicoxae** (Banks). Ariz. (Palmerlee).

*Pseudagenia mexicana* var. *flavicoxae* Banks, 1911. Ent. Soc. Wash., Proc. 13: 238. ♂, ♀.

*Pseudagenia mexicana* var. *flavicoxa* (!) Banks, 1912 (1911). N. Y. Ent. Soc., Jour. 19: 233.

**inermis** Townes. Tex.; Mexico (Morelos). Prey: *Lycosa* sp.

*Auplopus inermis* Townes, 1957. U. S. Natl. Mus., Bul. 209: 148. ♀.

Biology: Evans, 1964. Kans. Ent. Soc., Jour. 37: 306 (prey transport).

**mellipes mellipes** (Say). N. J. to Fla., west to Kans. and Tex. Ecology: Builds mud cells in cells

of abandoned nests of *Polistes*, *Sceliphron*, and *Trypargilum*, in borings in wood, beneath loose bark, under exposed roots, and in abandoned borings of ground-nesting

bees; occurs in woods. Parasite: *Sphaerophthalma pensylvanica scaeva* (Bl.). Prey:

*Pisaurina undata* Hentz, *P. mira* (Walck.); *Herpyllus vasifer* (Walck.); *Philodromus* sp.;

*Marpissa undata* (DeG.), *Phidippus audax* (Hentz), *P. sp.*

*Pompilus mellipes* Say, 1836. Boston Jour. Nat. Hist. 1: 304. ♀.

*Agencia fulvipes* Dahlbom, 1843. Hym. Europaea, v. 1, p. 92. ♀.

*Pseudagenia mellipes* var. *interior* Banks, 1912 (1911). N. Y. Ent. Soc., Jour. 19: 233. ♀.

Biology: Walsh, 1869. Amer. Ent. 1: 132 (nest). — Rau and Rau, 1916. Jour. Anim. Behavior 6:

42-43 (nest). — Rau and Rau, 1918. Wasp studies afield, pp. 86-89, figs. 18-20 (nest). — Rau,

1926. St. Louis Acad. Sci., Trans. 25: 196-197 (nest, prey). — Rau, 1928. St. Louis Acad. Sci.,

Trans. 25: 342-358 (nest, prey). — Krombein, 1952. Ent. Soc. Wash., Proc. 54: 176-177

(nesting behavior, prey). — Krombein, 1955. Brooklyn Ent. Soc., Bul. 50: 15 (prey).

— Townes, 1957. U. S. Natl. Mus., Bul. 209: 153 (nest). — Krombein, 1967. Trap-nesting

wasps and bees, pp. 171-173, pl. 9, fig. 45 (nest, life history).

**mellipes meridianus** Townes. Fla. (Paradise Key).

*Auplopus mellipes meridianus* Townes, 1957. U. S. Natl. Mus., Bul. 209: 154. ♀.

**mellipes variitarsatus** (Dalla Torre). Atlantic to 100° W. in Canad. and Transit. Zones.

Ecology: Makes mud nests in and under decaying logs and stumps, and in borings in wood; occurs in woods.

*Pompilus (Agencia) varipes* Cresson, 1867. Amer. Ent. Soc., Trans. 1: 126. ♀. Preocc.

*Agencia variitarsata* Dalla Torre, 1897. Cat. Hym., v. 8, p. 210. N. name.

Biology: Townes, 1957. U. S. Natl. Mus., Bul. 209: 155 (nest). — Evans and Yoshimoto, 1962.

Ent. Soc. Amer., Misc. Pub. 3: 110 (nest). — Medler, 1964. Ent. News 75: 191 (nest).

**mexicanus** (Cresson). South. Ariz.; Mexico (Veracruz).

*Pompilus (Agencia) mexicanus* Cresson, 1867. Amer. Ent. Soc., Trans. 1: 130. ♀.

**mollis** Townes. South. Tex.

*Auplopus mollis* Townes, 1957. U. S. Natl. Mus., Bul. 209: 157. ♀.

**nigrellus** (Banks). Most of south. Canad. and U. S., but not known from northwest except

Oreg., or from southeast; Mexico (Baja California). Ecology: Occurs in or at edge of

woods; builds mud cells beneath stones and in boring in stem. Prey: *Clubiona abboti*

Koch, *Trachela tranquillus* (Hentz), *T. sp.*; *Phidippus* spp., *Maevia inclemens* (Walck.);

*Anyphaena fraterna* Bks., *Ayscha gracilis* (Hentz).

*Pseudagenia nigrella* Banks, 1912 (1911). N. Y. Ent. Soc. Jour. 19: 232. ♀.

*Pseudagenia nanella* Banks, 1912. Canad. Ent. 44: 198. ♀.

Biology: Krombein, 1954. Brooklyn Ent. Soc., Bul. 49: 4 (prey). — Krombein, 1955. Brooklyn

Ent. Soc., Bul. 50: 15 (prey). — Townes, 1957. U. S. Natl. Mus., Bul. 209: 167 (nest).

— Evans and Yoshimoto, 1962. Ent. Soc. Amer., Misc. Pub. 3: 109 (prey transport).

— Parker and Bohart, 1966. Pan-Pacific Ent. 42: 94 (nest). — Kurczewski and Kurczewski,

1968. Kans. Ent. Soc., Jour. 41: 6 (prey transport). — Kurczewski and Kurczewski, 1968.

Kans. Ent. Soc., Jour. 41: 369 (prey).

**variolarum** Townes. Tex. (Chisos Mts.).

*Auplopus variolarum* Townes, 1957. U. S. Natl. Mus., Bul. 209: 149. ♀.

## Genus AGENIELLA Banks

### Genus AGENIELLA Subgenus LEUCOPHRUS Townes

*Ageniella* subg. *Leucophrus* Townes, 1951. U. S. Dept. Agr., Monog. 2: 917.

Type-species: *Priocnemis semitincta* Banks. Orig. desig.

- fulgifrons** (Cresson). U. Austr. and L. Austr. Zones from Atlantic to 100° W. Prey: *Phidippus andax* Hentz, P. sp., *Paraphidippus* sp. near *marginatus* (Walck.).  
*Pompilus* (*Priocnemis*) *fulgifrons* Cresson, 1867. Amer. Ent. Soc., Trans. 1: 114. ♀.  
*Pompilus* (*Agenia*) *agilis* Cresson, 1867. Amer. Ent. Soc., Trans. 1: 125. ♂.  
*Salix fulgidifrons* Dalla Torre, 1897. Cat. Hym., v. 8, p. 225. Emend.

Biology: Evans, 1959. Kans. Ent. Soc., Jour. 32: 75 (prey). —Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 6-7 (prey).

**incita** (Banks). Kans., Tex.

*Cryptocheilus incitus* Banks, 1912 (1911). N. Y. Ent. Soc., Jour. 19: 234. ♀.

**reynoldsi** (Banks). Colo., Kans., Tex.

*Priocnemis reynoldsi* Banks, 1933. Psyche 40: 12. ♀.

**semitincta** (Banks). Transcont. in U. Austr. and L. Austr. Zones. Prey: *Agelenopsis potteri* Blackw., *A. pennsylvanica* (Koch), A. spp.

*Priocnemis semitincta* Banks, 1912. Canad. Ent. 44: 197. ♀.

*Ageniella festina* Banks, 1917. Mus. Compar. Zool., Bul. 61: 109. ♂.

*Ageniella fraternella* Banks, 1917. Mus. Compar. Zool., Bul. 61: 109. ♂.

*Priophanes holonis* Banks, 1944. Mus. Compar. Zool., Bul. 94: 174. ♀.

Biology: Townes, 1957. U. S. Natl. Mus., Bul. 209: 171 (prey). —Kurczewski, 1961. Brooklyn Ent. Soc., Bul. 56: 24 (prey transport). —Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 7 (prey).

#### Genus AGENIELLA Subgenus NEMAGENIA Banks

*Ageniella* subg. *Nemagenia* Banks, 1944. Mus. Compar. Zool., Bul. 94: 179.

Type-species: *Pompilus* (*Agenia*) *longulus* Cresson. Orig. desig.

**longula** (Cresson). Calif., "Dakota", Kans., Mo., La., Tex.; British Guiana; Bolivia. Prey:

*Pardosa* sp., *Lycosa mccooki* Montgomery, L. sp.

*Pompilus* (*Agenia*) *longulus* Cresson, 1867. Amer. Ent. Soc., Trans. 1: 129. ♂.

*Agenia longa* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 205. "♀" = ♂.

*Priocnemis directa* Banks, 1912. Canad. Ent. 44: 197. ♀.

*Priophanes otiosa* Banks, 1946. Mus. Compar. Zool., Bul. 96: 442. ♀.

Biology: Townes, 1951. U. S. Dept. Agr., Monog. 2: 918 (prey). —Evans, 1959. Kans. Ent. Soc., Jour. 32: 75 (prey).

#### Genus AGENIELLA Subgenus PRIOPHANES Banks

*Priophanes* Banks, 1944. Psyche 50: 82.

Type-species: *Priocnemis facetus* Cresson. Orig. desig.

**agenioides** (Fox). Atlantic to 100° W. in U. Austr. and L. Austr. Zones. Prey: *Xysticus* sp.;

*Maevia inclemens* (Walck.), *M. vittata* (Hentz), Salticidae sp.

*Priocnemis agenioides* Fox, 1893. N. Y. Ent. Soc., Jour. 1: 54. ♀.

*Pseudagenia virginica* Banks, 1910. Psyche 17: 251. ♂.

*Ageniella subra* Brimley, 1934. Ent. News 45: 42. ♂.

Biology: Townes, 1957. U. S. Natl. Mus., Bul. 209: 187 (prey). —Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 8 (prey transport).

**arcuata** (Banks). Md. to Fla., Alta., Colo., Kans., Tex. to south. Calif.; Mexico (Nayarit, Durango, Zacatecas, Teotihuacan, Veracruz, Jalisco). Prey: *Oxyopes salticus* Hentz; *Misumenops celer* Hentz, *Sassacus papenhoei* Peckh.

*Cryptocheilus arcuatus* Banks, 1910. N. Y. Ent. Soc., Jour. 18: 120. ♀.

*Pseudagenia birkmanni* Banks, 1910. N. Y. Ent. Soc., Jour. 18: 124. ♂.

Biology: Evans and Yoshimoto, 1962. Ent. Soc. Amer., Misc. Pub. 3: 107 (prey transport). —Evans, 1964. Kans. Ent. Soc., Jour. 37: 306 (prey transport).

**arizonica arizonica** (Banks). Ariz. (Tempe).

*Priocnemis arizonica* Banks, 1933. Psyche 40: 14. ♀.

**arizonica concolor** Townes. Kans. (Manhattan).

*Agieniella* (*Priophanes*) *arizonica concolor* Townes, 1957. U. S. Natl. Mus., Bul. 209: 179. ♀, ♂.

**carolae** Wasbauer. Calif. (Riverside Co.). On flowers of *Asclepias erosa*.

*Agieniella* (*Priophanes*) *carolae* Wasbauer, 1959. Kans. Ent. Soc., Jour. 32: 109, fig. 4. ♀.

**faceta faceta** (Cresson). Md. to Ga., Tex. Prey: *Pardosa* sp., *Schizocosa* sp.

*Priocnemis facetus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 205. ♀.

*Cryptocheilus pallescens* Banks, 1910. N. Y. Ent. Soc., Jour. 18: 121. ♀.

Biology: Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 8 (prey).

**faceta ventralis** Townes. Fla.; Mexico (Nuevo Leon).

*Agieniella* (*Priophanes*) *faceta ventralis* Townes, 1957. U. S. Natl. Mus., Bul. 209: 183. ♀, ♂.

**fuscipennis** Townes. Calif. Prey: *Oxyopes salticus* Hentz; *Xysticus* sp.

*Agieniella* (*Priophanes*) *fuscipennis* Townes, 1957. U. S. Natl. Mus., Bul. 209: 189. ♀.

Taxonomy: Wasbauer, 1959. Kans. Ent. Soc., Jour. 32: 109-111, figs. 1-3. ♂.

Biology: Hurd and Wasbauer, 1956. Kans. Ent. Soc., Jour. 29: 169 (prey). —Wasbauer and Powell, 1962. Kans. Ent. Soc., Jour. 35: 395 (prey).

**placita placita** (Banks). Ala., La., Tex.

*Cryptocheilus placitus* Banks, 1910. N. Y. Ent. Soc., Jour. 18: 122. ♀.

*Pseudagenia apicipennis* Banks, 1910. N. Y. Ent. Soc., Jour. 18: 123. ♂.

**placita sonorensis** Townes. Calif.; Mexico (Nogales).

*Agieniella* (*Priophanes*) *placita sonorensis* Townes, 1957. U. S. Natl. Mus., Bul. 209: 185. ♀.

**rufescens** (Banks). Kans., N. Mex., Ariz., Wyo.

*Priocnemis rufescens* Banks, 1939. Canad. Ent. 71: 229. ♀.

#### Genus AGENIELLA Subgenus AGENIELLA Banks

*Agieniella* Banks, 1912 (1911). N. Y. Ent. Soc., Jour. 19: 222.

Type-species: *Pompilus* (*Agenia*) *acceptus* Cresson. Orig. desig.

**accepta** (Cresson). Transcont. in L. Austr. Zone; Mexico (Coahuila). Prey: *Lycosa* sp.

*Pompilus* (*Agenia*) *acceptus* Cresson, 1867. Amer. Ent. Soc., Trans. 1: 130. ♀.

*Pseudagenia texana* Banks, 1910. N. Y. Ent. Soc., Jour. 18: 125. ♂.

*Agieniella adara* Brimley, 1934. Ent. News 45: 41. ♂.

Biology: Dow, 1930. Psyche 37: 182 (prey).

**blaisdelli** (Fox). South. B. C. to south. Calif., Idaho, Utah in Transit. and U. Austr. Zones.

Ecology: Nests in compacted sand along river. Prey: *Pardosa* sp., *Tarentula* sp., prob. *kochi* (Keys.).

*Pseudagenia blaisdelli* Fox, 1892. Ent. News 3: 171. ♀.

*Agieniella praestans* Banks, 1914. N. Y. Ent. Soc., Jour. 22: 305. ♂.

Biology: Wasbauer and Leech, 1973. Pan-Pacific Ent. 49: 182 (prey, nest).

**conflicta** Banks. Alta., U. S., Transcont., mostly in U. Austr. Zone; Guatemala. Prey: *Trochosa gosiuta* Chamb., *T. avara* (Keys.), *T. sp.*, *Arctosa littoralis* Hentz, *Pardosa valens* Barnes, *Lycosa* spp.

*Pompilus* (*Agenia*) *petiolatus* Cresson, 1867. Amer. Ent. Soc., Trans. 1: 127. ♂. Preocc.

*Agieniella accepta* var. *conflicta* Banks, 1944. Mus. Compar. Zool., Bul. 94: 176. ♀.

Biology: Hurd and Wasbauer, 1956. Kans. Ent. Soc., Jour. 29: 169 (prey). —Townes, 1957. U. S. Natl. Mus., Bul. 209: 211 (prey). —Evans and Yoshimoto, 1962. Ent. Soc. Amer., Misc. Pub. 3: 106-107 (prey capture, transport). —Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 7 (prey transport).

**coronata** Banks. South. B. C. to south. Calif., Utah in Transit. and U. Austr. Zones. Prey:

*Clubionidae* sp., prob. *Liocranoides* sp.

*Agieniella coronata* Banks, 1919. Mus. Compar. Zool., Bul. 63: 242. ♀.

Biology: Wasbauer and Leech, 1973. Pan-Pacific Ent. 49: 182 (prey).



- cupida** (Cresson). N. Y., Pa., Va., W. Va., Ga., Iowa, Kans., Colo.; Guatemala.  
*Pompilus (Agenia) cupidus* Cresson, 1867. Amer. Ent. Soc., Trans. 1: 122. ♀.
- euphorbiae** (Viereck). Common in Calif., less common in B. C., Oreg., Ariz., N. Mex., Colo., and Tex. Prey: *Agelenopsis* sp.; *Pardosa* sp.  
*Agenia euphorbiae* Viereck, 1903 (1902). Acad. Nat. Sci. Phila., Proc. p. 734. ♂.  
*Ageniella subaequalis* Banks, 1919. Mus. Compar. Zool., Bul. 63: 243. ♂.
- Biology: Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 7 (prey).
- evansi** Townes. Ariz., N. Mex.; Mexico (Teotihuacan). Prey: *Lycosa* sp., *Tarentula kochi* Keys.  
*Ageniella (Ageniella) evansi* Townes, 1957. U. S. Natl. Mus., Bul. 209: 205. ♀.
- Biology: Townes, 1957. U. S. Natl. Mus., Bul. 209: 206 (prey). — Evans, 1959. Kans. Ent. Soc., Jour. 32: 76 (prey).
- grisea** Townes. Idaho (Hollister, Wendell).  
*Ageniella (Ageniella) grisea* Townes, 1957. U. S. Natl. Mus., Bul. 209: 195. ♀.
- mintaka** Brimley. Fla., N. C., Va., W. Va.  
*Ageniella mintaka* Brimley, 1928. Elisha Mitchell Sci. Soc., Jour. 43: 202. ♂.
- neglecta** Banks. Colo., N. Mex., Ariz.; Mexico (Puebla, Zacatecas, Teotihuacan).  
*Ageniella neglecta* Banks, 1944. Mus. Compar. Zool., Bul. 94: 176. ♂.
- nivalis** (Cameron). Ariz.; Mexico (Durango, Guerrero). Host: *Lycosa* sp.  
*Salix nivalis* Cameron, 1893. Biol. Cent.-Amer., Hym., v. 2, p. 182, pl. 11, fig. 2. ♀.
- Biology: Evans, 1964. Kans. Ent. Soc., Jour. 37: 306-307 (prey transport).
- norata** Banks. Ont. and Mass. south to N. C., Ind., Kans. Ecology: Occurs in woods.  
*Ageniella norata* Banks, 1914. N. Y. Ent. Soc., Jour. 22: 305. ♂.  
*Ageniella cupidella* Banks, 1915. Canad. Ent. 47: 400. ♀.
- pallida** Banks. Iowa, Nebr., Kans., Tex.  
*Ageniella pallida* Banks, 1945. Psyche 52: 106. ♀.
- partita** Banks. Transcont. in U. Austr. and L. Austr. Zones; Mexico (Durango, Puebla, Nayarit, Zacatecas, Hidalgo). Parasite: *Ceropales hatoda* Brim. Prey: *Gnaphosa sericata* (Koch), *Zelus* sp., *Aretosa littoralis* (Hentz), *A. sp.*, *Pardosa falcifera* Camb.  
*Ageniella partita* Banks, 1919. Mus. Compar. Zool., Bul. 63: 244. ♂.  
*Alasagenia rubineus* Dreisbach, 1950. Ent. News. 61: 68. ♀.
- Biology: Krombein, 1955. Brooklyn Ent. Soc., Bul. 50: 15 (parasite). — Townes, 1957. U. S. Natl. Mus., Bul. 209: 194 (prey). — Evans and Yoshimoto, 1962. Ent. Soc. Amer., Misc. Pub. 3: 107 (prey transport). — Wasbauer and Powell, 1962. Kans. Ent. Soc., Jour. 35: 395 (prey). — Kurczewski, 1963. Fla. Ent. 46: 209 (prey transport). — Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 7-8 (prey). — Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 369 (prey).
- seminole** Townes. Fla.  
*Ageniella (Ageniella) seminole* Townes, 1957. U. S. Natl. Mus., Bul. 209: 196. ♀, ♂.
- submetallica** (Banks). Tex. (Austin).  
*Pseudagenia submetallica* Banks, 1917. Mus. Compar. Zool., Bul. 61: 108. ♀.
- utilis delicata** Banks. D. C., Va., S. C.  
*Ageniella delicata* Banks, 1944. Mus. Compar. Zool., Bul. 94: 174. ♂.  
*Ageniella restricta* Banks, 1944. Mus. Compar. Zool., Bul. 94: 175. ♂.
- utilis utilis** (Cameron). Fla., La., Tex.; Mexico (Tabasco), Panama.  
*Pseudagenia utilis* Cameron, 1891. Biol. Cent.-Amer., Hym. v. 2, p. 170. ♀.  
*Ageniella obscura* Banks, 1925. Mus. Compar. Zool., Bul. 67: 331. ♀.
- vogeli** Townes. Carol. Fauna, Pa. to Ga., Kans. Prey: *Lycosa avara* (Keys.), juv.  
*Ageniella (Ageniella) vogeli* Townes, 1957. U. S. Natl. Mus., Bul. 209: 202. ♀, ♂.
- Biology: Townes, 1957. U. S. Natl. Mus., Bul. 209: 203 (prey).

#### Genus AGENIELLA Subgenus AMERAGENIA Banks

*Ameragenia* Banks, 1945. Bol. Ent. Venezolana 4: 125.

Type-species: *Ameragenia irene* Banks. Monotypic.

*Pseudageniella* Haupt, 1959. Nova Acta Leopoldina 21, no. 141: 22-23.

Type-species: *Pompilus rusticus* Fabricius. Orig. desig.

*Allageniella* Haupt, 1959. Nova Acta Leopoldina 21, no. 141: 23.

Type-species: *Allageniella obsoleta* Haupt. Orig. desig.

*Brachyagenia* Haupt, 1959. Nova Acta Leopoldina 21, no. 141: 25.

Type-species: *Brachyagenia nigra* Haupt. Orig. desig.

*Parageniella* Haupt, 1959. Nova Acta Leopoldina 21, no. 141: 26.

Type-species: *Prionemesis rufifemoratus* Taschenberg. Orig. desig.

*fasciata* Townes. Tex. (Brownsville); Mexico (Cordoba).

*Ageniella* (*Ameragenia*) *fasciata* Townes, 1957. U. S. Natl. Mus., Bul. 209: 217. ♀.

*salti* (Banks). Fla.; Cuba. Prey: *Clubiona* spp.

*Prionemella salti* Banks, 1928. Studies on Cuban Insects, v. 1, p. 6. ♀.

*Prionemesis osceola* Banks, 1939. Canad. Ent. 71: 230. ♀.

Biology: Townes, 1957. U. S. Natl. Mus., Bul. 209: 219 (prey). — Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 8 (prey).

*striga* Townes. Tex. (Brownsville).

*Ageniella* (*Ameragenia*) *striga* Townes, 1957. U. S. Natl. Mus., Bul. 209: 216. ♀.

### Genus PRIONEMELLA Banks

*Prionemesis* subg. *Prionemella* Banks, 1925. Mus. Compar. Zool., Bul. 67: 337.

Type-species: *Prionemesis* (*Prionemella*) *fairchildi* Banks. Desig. by Pate, 1946.

*Eragenia* Banks, 1946. Mus. Compar. Zool., Bul. 96: 421.

Type-species: *Eragenia infelix* Banks. Orig. desig.

*Cosmagenia* Haupt, 1959. Nova Acta Leopoldina 21, no. 141: 27-28.

Type-species: *Agenia amabilis* Taschenberg. Orig. desig.

*tabascoensis* (Cameron). South Tex. to Ecuador.

*Pseudagenia tabascoensis* Cameron, 1891. Biol. Cent.-Amer., Hym., v. 3, p. 172. ♂.

*Ageniella rufula* Banks, 1945. Bol. Ent. Venezolana 4: 117. ♀.

### SUBFAMILY POMPILINAE

Revision: Evans, 1966. Amer. Ent. Soc., Mem. 20: 1-442, 2 text figs., 80 maps, 11 pls.

(Mexican and Cent. Amer. spp.; includes records and synonymy of some spp. north of Mexico).

### TRIBE APORINI

Wasps of this tribe, so far as known, prey upon trapdoor spiders (Ctenizidae); the burrow of the spider is utilized as a nest by the wasp.

Revision: Bradley, 1944. Amer. Ent. Soc., Trans. 70: 32-139 (New World spp.).

### Genus EPIPOMPILUS Kohl

*Epipompilus* Kohl, 1885. K. K. Zool.-Bot. Ges. Wien, Verh. 34: 57.

Type-species: *Epipompilus maximiliani* Kohl. Desig. by Ashmead, 1900.

*Autocostethus* Ashmead, 1902. Canad. Ent. 54: 133.

Type-species: *Autocostethus bifasciatus* Ashmead. Orig. desig.

*Epicostethus* Banks, 1947. Mus. Compar. Zool., Bul. 99: 445.

Type-species: *Epicostethus williamsi* Banks. Orig. desig.

Revision: Evans, 1961. Psyche 68: 25-37.

*pulcherrimus* (Evans). Fla. (Royal Palm Hammock in Everglades Natl. Park); Bahamas (Andros Is.).

*Autocostethus pulcherrimus* Evans, 1955. Ent. News 66: 150. ♀.

## Genus APORUS Spinola

## Genus APORUS Subgenus APORUS Spinola

*Aporus* Spinola, 1808. Insectorum Liguria, v. 2, p. 5.

Type-species: *Aporus bicolor* Spinola. Desig. by Latreille, 1810.

*Actenopoda* Ashmead, 1902. Canad. Ent. 34: 88.

Type-species: *Actenopoda rileyi* Ashmead, Orig. desig. (= *Planiceps niger* Cresson).

*Melanaporus* Ashmead, 1902. Canad. Ent. 34: 132.

Type-species: *Planiceps euferalis* Fox. Orig. desig.

*Odontaporus* Bradley, 1944. Amer. Ent. Soc., Trans. 70: 110.

Type-species: *Planiceps notabilis* Smith. Orig. desig.

**calcaratus** (Fox). S. Fla.

*Planiceps calcaratus* Fox, 1893. Canad. Ent. 25: 115. ♂.

**concolor** (Smith). Tex. to Calif., s. to Costa Rica.

*Planiceps concolor* Smith, 1860. Jour. Ent. 1: 80. ♀.

*Pompilus monticola* Cameron, 1893. Biol. Cent.-Amer., Hym. 2: 190. ♂.

**luxus assimilis** (Banks). U. Sonor. and Transit. Faunas, Calif. and Utah to B. C. and Idaho.

*Planiceps assimilis* Banks, 1917. Mus. Compar. Zool., Bul. 61: 100. ♀.

**luxus luxus** (Banks). L. Sonor. Fauna of Calif., Ariz. Ecology: Occurs in sandy areas.

*Planiceps luxus* Banks, 1914. N. Y. Ent. Soc., Jour. 22: 304. ♀, ♂.

**niger** (Cresson). Carol. and Austrorip. Faunas, Tex. and Fla. to Nebr., Ill., south. Ont. and Mass.

*Planiceps niger* Cresson, 1867. Amer. Ent. Soc., Trans. 1: 136. ♀. Preocc. in *Pompilus*.

*Planiceps minor* Fox, 1893. N. Y. Ent. Soc., Jour. 1: 55. ♂.

*Planiceps dubius* Fox, 1893. N. Y. Ent. Soc., Jour. 1: 55. ♂.

*Planiceps clericus* Dalla Torre, 1897. Cat. Hym., v. 8, p. 281. N. name.

*Planiceps compressus* Banks, 1917. Mus. Compar. Zool., Bul. 61: 99. ♀.

*Aporus* (*Aporus*) *hermes* Bradley, 1944. Amer. Ent. Soc., Trans. 70: 94. ♀, ♂.

Taxonomy: Evans, 1956. Ent. News. 67: 6 (Syn. of *hermes*).

**notabilis prolongatus** Evans. South. Tex.; Mexico (Tamaulipas, Nuevo Leon, Durango, Veracruz). Typical *notabilis* (Sm.) ranges from south. Mexico to Costa Rica.

*Aporus* (*Aporus*) *notabilis prolongatus* Evans, 1966. Amer. Ent. Soc., Mem. 20: 57. ♀, ♂.

**notabilis pulchritarsis** (Cameron). South. Ariz. to Oaxaca and Yucatan.

*Pompilus* (*Planiceps*) *pulchritarsis* Cameron, 1893. Biol. Cent.-Amer., Hym. 2: 185. ♀.

*Planiceps bequaerti* Banks, 1931. Brooklyn Ent. Soc., Bul. 26: 131. ♀. Intergrade with typical *notabilis* (Sm.).

*Planiceps yavapai* Banks, 1933. Psyche 40: 1. ♀.

## UNPLACED TAXA OF APORUS SUBGENUS APORUS SPINOLA

**concolor** (Patton). Kans.

*Planiceps concolor* Patton, 1879. U. S. Geol. Geog. Survey, Bul. 5: 367. ♀.

**feralis** (Cresson). Tex.

*Planiceps feralis* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 207. "♀" = ♂.

## NOMEN NUDUM IN APORUS SUBGENUS APORUS SPINOLA

*Actenopoda rileyi* Ashmead, 1902. Canad. Ent. 34: 88.

## Genus APORUS Subgenus PLECTRAPORUS Bradley

*Aporus* subg. *Plectraporus* Bradley, 1944. Amer. Ent. Soc., Trans. 70: 97.

Type-species: *Planiceps hirsutus* Banks. Orig. desig.

**hirsutus** (Banks). Oreg. and Idaho to Calif. and Ariz.; Mexico (Baja California). Ecology: Nests in sand dunes in burrows of trapdoor spider prey. Prey: *Aptostiehus* sp., prob. *stanfordianus* Sm.

*Planiceps hirsutus* Banks, 1917. Mus. Compar. Zool., Bul. 61: 99. ♀.

Biology: Williams, 1928. Hawaii. Sugar Planter's Assoc. Expt. Sta., Ent. Ser., Bul. 19: 135-140, figs. 201, 204 (hunting behavior).

#### Genus CHELAPORUS Bradley

*Chelaporus* Bradley, 1944. Amer. Ent. Soc., Trans. 70: 116.

Type-species: *Pedinaspis anomala* Banks. Orig. desig.

**anomala** (Banks). Austrorip. Fauna of Tex.; Mexico south to Veracruz.

*Pedinaspis anomala* Banks, 1917. Mus. Compar. Zool., Bul. 61: 100. ♀.

#### Genus ALLAPORUS Banks

*Allaporus* Banks, 1933. Psyche 40: 2.

Type-species: *Planiceps pulchella* Banks. Orig. desig. (= *Aporus rufiventris* Cresson).

**aurulentus** Evans. Ariz. (Cochise Co.).

*Allaporus aurulentus* Evans, 1966. Amer. Ent. Soc., Mem. 20: 78. ♀, ♂.

**fascipennis** Evans. Tex. (Cameron Co.).

*Allaporus fascipennis* Evans, 1959. Kans. Ent. Soc., Jour. 32: 29. ♀, ♂.

**pulchellus** (Banks). Transcont. in U. S., Pa. to Oreg. in U. and L. Austr. Zones, south in Mexico to Campeche.

*Planiceps pulchella* Banks, 1910. N. Y. Ent. Soc., Jour. 18: 123. ♀.

*Planiceps hesperus* Banks, 1929. Psyche 36: 327. ♀, ♂.

*Euplaniceps aquilonaris* Dreisbach, 1952. Ent. News 63: 95, 3 figs. ♂.

**rufiventris** (Cresson). Tex. and southeast. Ariz. south to Morelos and Michoacan.

*Aporus rufiventris* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 207. ♀. Preocc. in *Pompilus*.

*Aporus minimus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 207. ♂.

*Pompilus rufiventricosus* Dalla Torre, 1897. Cat. Hym., v. 8, p. 318. N. name.

*Allaporus mexicanus* Evans, 1950. Ent. News 61: 3. ♀.

**smithianus** (Cameron). South. Tex., Ariz., Calif. south to Morelos and Veracruz.

*Pompilus (Aporus) smithianus* Cameron, 1893. Biol. Cent.-Amer., Hym. 2: 191, pl. 11, fig. 9. ♀.

*Allaporus amabilis* Evans, 1950. Ent. News 61: 2. ♀.

#### Genus PSORTHASPIS Banks

*Pedinaspis* subg. *Psorthaspis* Banks, 1912 (1911). N. Y. Ent. Soc., Jour. 19: 231.

Type-species: *Ferreola laevifrons* Cresson. Orig. desig.

*Idopedinaspis* Haupt, 1930. Berlin Zool. Mus., Mitt. 16: 724, 783.

Type-species: *Ferreola laevifrons* Cresson. Desig. by Haupt, 1937.

*Idiopedinaspis* (!) Neave, 1939. Nomencl. Zool. 2: 762.

*Dicyrtomalis* Bradley, 1944. Notulae Nat. 145: 11.

Type-species: *Pompilus connexus* Cresson. Orig. desig.

Taxonomy: Evans, 1954. Amer. Mus. Novitates 1662: 14-17 (keys to males, and all black females).

**australis** (Banks). Tex.

*Pedinaspis australis* Banks, 1910. N. Y. Ent. Soc., Jour. 18: 122. ♂.

**brimleyi** (Malloch). Austrorip. Fauna, Tex., Ark. to N. C.

*Pedinaspis brimleyi* Malloch, 1928. Ent. Soc. Wash., Proc. 30: 101. ♀.

**legata** (Cresson). Austrorip. Fauna, Tex., Kans., and Fla. to Tenn. and Md. Ecology: Occurs in woods.

*Pompilus* (?) *legatus* Cresson, 1867. Amer. Ent. Soc., Trans. 1: 109. ♀.

**luctuosa** (Banks). Tex.

*Pedinaspis luctuosa* Banks, 1910. N. Y. Ent. Soc., Jour. 18: 123. ♀.

**macronotum arizonensis** Dreisbach. South. Ariz. Typical *macronotum* (Kohl) is Mexican.

*Psorthaspis arizonensis* Dreisbach, 1950. Brooklyn Ent. Soc., Bul. 45: 119. ♀.

**macronotum cressoni** Bradley. Tex. south in Mexico to Veracruz.

*Psorthaspis levis* Bradley, 1944. Amer. Ent. Soc., Trans. 70: 43. ♂.

*Psorthaspis nahuatlensis* Bradley, 1944. Amer. Ent. Soc., Trans. 70: 46, pl. 3, figs. 2, 13, 26. ♂.

*Psorthaspis cressoni* Bradley, 1944. Amer. Ent. Soc., Trans. 70: 59. ♀, ♂.

Taxonomy: Evans, 1954. Amer. Mus. Novitates 1662: 11 (as first reviser placed *levis* as syn. of *cressoni*).

**magna** (Banks). Tex. (Lee Co.).

*Aporus magnus* Banks, 1910. N. Y. Ent. Soc., Jour. 18: 126. ♂.

**mariae** (Cresson). Austrorip. and Carol. Faunas, Fla. and Tenn. to Ill. and N. J. Ecology: Occurs in woods.

*Pompilus* (?) *mariae* Cresson, 1867. Amer. Ent. Soc., Trans. 1: 108. ♀.

*Pedinaspis mariae* var. *antennalis* Banks, 1921. Ent. Soc. Amer., Ann. 14: 21. ♀.

Taxonomy: Krombein, 1956. Ent. Soc. Wash., Proc. 58: 155 (sex association).

**nigriceps** (Banks). N. Mex., Ariz., Utah.

*Pedinaspis nigriceps* Banks, 1933. Psyche 40: 2. ♀.

**planata** (Fox). Calif., Utah, Ariz.; Mexico (Baja California). Prey: *Bothriocyrtum californicum* (Camb.).

*Planiceps planatus* Fox, 1892. Ent. News 3: 171. ♀.

*Pompilus aequus* Fox, 1894. Calif. Acad. Sci., Proc. (2) 4: 99. ♀.

*Sophropompilus tumifrons* Banks, 1917. Mus. Compar. Zool., Bul. 61: 103. ♂.

*Pedinaspis bucephala* Malloch, 1928. Ent. Soc. Wash., Proc. 30: 101. ♂.

*Pedinaspis albocaudata* Malloch, 1928. Ent. Soc. Wash., Proc. 30: 101. ♂.

*Psorthaspis morosa* Bradley, 1944. Amer. Ent. Soc., Trans. 70: 42. ♀.

Biology: Davidson, 1915. Ent. News 16: 233 (prey). —Jenks, 1938. Natl. Geog. Mag. 74: 807-828.

**portiae conocephala** Bradley. Tex.; Mexico (Nuevo Leon).

*Psorthaspis conocephala* Bradley, 1944. Amer. Ent. Soc., Trans. 70: 67. ♂.

**portiae portiae** (Rohwer). South. Ariz. to Sinaloa and Jalisco, east to Nuevo Leon.

*Pedinaspis* (*Psorthaspis*) *portiae* Rohwer, 1920. U. S. Natl. Mus., Proc. 57: 228. ♀.

**sanguinea** (Smith). Austrorip. Fauna, Tex. and Fla. to Kans. and N. C.

*Ferreola sanguinea* Smith, 1855. Cat. Hym. Brit. Mus., v. 3, p. 170. ♀.

*Parapompilus contiguus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 206. ♀.

**texana** (Cresson). Austrorip. Fauna of Tex.

*Parapompilus texanus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 206. ♀.

**vicina** (Cresson). Tex.; Mexico (Tamaulipas).

*Parapompilus vicinus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 206. ♀. Preoccupied in *Pompilus*.

*Pompilus bombinator* Dalla Torre, 1897. Cat. Hym., v. 8, p. 277. N. name.

#### TRIBE POMPILINI

Revision: Evans, 1950-51. Amer. Ent. Soc., Trans. 75: 133-270; 76: 207-361; 77: 203-340.

Taxonomy: Dreisbach, 1949. Ent. Amer. (n. s.) 29: 5-12 (key to N. Amer. and Antillean genera).

#### Genus TASTIOTENIA Evans

*Tastiotenia* Evans, 1950. Amer. Ent. Soc., Trans. 75: 150.

Type-species: *Tastiotenia festiva* Evans. Orig. desig.

**festiva** Evans. South. Calif. to west. Tex.; Mexico (Sonora). Ecology: Occurs on sandy deserts; probably nests on side of pre-existing burrow in sand. Prey: *Latrodectus mactans* F.

*Tastiotenia festiva* Evans, 1950. Amer. Ent. Soc., Trans. 75: 152. ♀.

Taxonomy: Evans, 1954. Pan-Pacific Ent. 30: 103. ♂.

Biology: Evans, 1961. Southwest. Naturalist 6: 51-52 (prey, probable nest site).

Genus **CHALCOCHARES** Banks

*Psammochares* subg. *Chalcochares* Banks, 1917. Mus. Compar. Zool., Bul. 61: 107.

Type-species: *Psammochares hirsutifemur* Banks. Monotypic.

*Anotochares* Banks, 1939. Canad. Ent. 71: 225, 228.

Type-species: *Anotochares engleharti* Banks. Monotypic.

*engleharti* (Banks). Tex.; Mexico east of Sierra Madre Occidentale, south to Hidalgo.

*Anotochares engleharti* Banks, 1939. Canad. Ent. 71: 228. ♀.

*hirsutifemur* (Banks). L. Sonor. Fauna, west. Tex. to Calif.; south in Mexico to Zacatecas.

*Psammochares hirsutifemur* Banks, 1914. N. Y. Ent. Soc., Jour. 22: 304. ♀.

Genus **EVAGETES** Lepeletier

*Evagetes* Lepeletier, 1845. Hist. Nat. Ins. Hym., v. 3, p. 390.

Type-species: *Evagetes bicolor* Lepeletier. Monotypic (= *Aporus dubius* Vander Linden).

*Sophropompilus* Howard, 1901. Insect Book, pl. VII, fig. 13.

Type-species: *Pompilus ingenuus* Cresson. Monotypic.

*Nannopompilus* Ashmead, 1902. Canad. Ent. 34: 82.

Type-species: *Nannopompilus argenteus* Ashmead. Monotypic (= *Pompilus parvus* Cresson).

*Leuchimon* Haupt, 1930. Zool. Mus. Berlin, Mitt. 16: 792.

Type-species: *Leuchimon palmatus* Haupt. Orig. desig.

*Psammocharoides* Moczar, 1946. Hist. Nat. Mus. Natl. Hungarici, Ann. 39: 114.

Type-species: *Pompilus crassicornis* Shuckard. Orig. desig.

*Streptosella* Dreisbach, 1950. Amer. Midland Nat. 43: 570.

Type-species: *Streptosella steyskali* Dreisbach. Orig. desig.

*Evagetes* subg. *Contempevages* Wolf, 1970. Beitr. z. Ent. 20: 52.

Type-species: *Pompilus contemptus* Tournier. Orig. desig.

*Evagetes* subg. *Carinevages* Wolf, 1970. Beitr. z. Ent. 20: 52.

Type-species: *Pompilus crassicornis* Shuckard. Orig. desig.

Members of this genus are social parasites of other Pompilini. The females seek the freshly filled nests of their hosts, usually in sandy places, dig into them, destroy the host egg, deposit one of their own, and refill the burrow.

*asignus* Dreisbach. Mass. south to Fla., west to Mich., Alta., Colo., Tex.; Mexico (Chihuahua, Durango, Zacatecas).

*Evagetes asignus* Dreisbach, 1956. Ent. News 67: 147, 2 figs. ♂, ♀.

*calefactus* Evans. Calif., Ariz., Tex., Mont. ?

*Evagetes calefactus* Evans, 1966. Amer. Ent. Soc., Mem. 20: 136. ♀, ♂.

*crassicornis consimilis* (Banks). Canad. and Transit. Faunas, Yukon and Man. to higher parts of N. Mex. and Calif.

*Pompiloides consimilis* Banks, 1912 (1911). N. Y. Ent. Soc., Jour. 19: 228. ♀, ♂.

*crassicornis crassicornis* (Shuckard). Canad. Zone, N. S. and Yukon to Wash., N. Dak., Mich., and Pa.; Europe.

*Pompilus crassicornis* Shuckard, 1835. Essay on Indig. Fossor. Hym., p. 63. ♀.

*Pompiloides rufibasis* Banks, 1912 (1911). N. Y. Ent. Soc., Jour. 19: 226. ♀.

*Streptosella michiganensis* Dreisbach, 1950. Amer. Midland Nat. 43: 571. Nom. nud., a lapsus for *steyskali*.

*Streptosella steyskali* Dreisbach, 1950. Amer. Midland Nat. 43: 571, figs. 1, 2. ♂.

*Streptosella albertensis* Dreisbach, 1950. Amer. Midland Nat. 43: 572, figs. 3, 4. ♂.

*Streptosella stricklandi* Dreisbach, 1950. Amer. Midland Nat. 43: 574, figs. 5, 6. ♂.

*hyacinthinus* (Cresson). Transcont., L. Austr. to Transit. Zone. Ecology: Sandy places, especially along streams.

*Pompilus hyacinthinus* Cresson, 1867. Amer. Ent. Soc., Trans. 1: 90. ♀.

*Pompilus brevicornis* Cresson, 1867. Amer. Ent. Soc., Trans. 1: 90. ♂.

*Pompilus castaneus* Provancher, 1882. Nat. Canad. 13: 35, 39. ♂.

*Psammochares (Arachnophila) scudderii* Banks, 1917. Mus. Compar. Zool., Bul. 61: 104, 107. ♀.

- Sophropompilus bradleyi* Banks, 1919. Mus. Compar. Zool., Bul. 63: 237. ♀.  
*Nannopompilus texanus* Banks, 1944. Mus. Compar., Zool., Bul. 94: 170. ♀.  
**ingenuus** (Cresson). Transcont. in U. Austr. and lower part of Transit. Zone; Mexico (Chihuahua, Mexico). Ecology: Occurs in sandy places, and on flowers of *Solidago* and *Daucus carota*.  
*Pompilus ingenuus* Cresson, 1867. Amer. Ent. Soc., Trans. 1: 89. ♀, ♂.  
*Pompilus brevicornis* Taschenberg, 1869. Ztschr. Gesell. Naturw. 34: 50. ♂, ♀. Preocc.  
*Pompilus Fiorentinii* Dalla Torre, 1897. Cat. Hym., v. 8, p. 289. N. name.  
**macswaini** Evans. Calif., Wyo.  
*Evages macswaini* Evans, 1957. Pan-Pacific Ent. 33: 181, fig. 1. ♂, ♀.  
**mohave** (Banks). N. Y. to Fla., through southern U. S. to Calif., in western Mexico south to Guerrero and Puebla. Host: *Anoplius apiculatus autumnalis* (Bks.), *A. americanus juxtus* (Cr.).  
*Sophropompilus quadrispinosus* Banks, 1919. Canad. Ent. 51: 82. Preocc. in *Evages*.  
*Sophropompilus mohave* Banks, 1933. Psyche 40: 6. ♀.  
 Taxonomy: Krombein, 1953. Wasmann Jour. Biol. 10: 320-323. ♀, ♂.  
 Biology: Evans, Lin and Yoshimoto, 1953. N. Y. Ent. Soc., Jour. 61: 72-77 (hosts).  
**padrinus minusculus** (Banks). Austrorip. to Transit. Fauna, Tex. and Fla. to Man., Mich., Ont., and N. H.; Mexico (Tamaulipas, Coahuila). Host: *Episyrion q. quinquenotatus* (Say).  
*Psammochares minusculus* Banks, 1910. N. Y. Ent. Soc., Jour. 18: 118. ♀.  
 Biology: Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 8-9 (host).  
**padrinus padrinus** (Viereck). B. C., N. W. T. and Man. south to Baja California and, at moderate to high elevations, to El Salvador. Ecology: Occurs in sandy areas.  
*Anoplius (Pompilinus) padrinus* Viereck, 1903 (1902). Acad. Nat. Sci. Phila., Proc. 54: 734. ♂.  
**parvus** (Cresson). Transcont. in Canadian to U. Austral Zones, Yukon, N. W. T. and N. S. to Calif. and Ga., south to Costa Rica. Ecology: Occurs in sandy places.  
*Pompilus parvus* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 453. ♀.  
*Pompilus subviolaceus* Cresson, 1867. Amer. Ent. Soc., Trans. 1: 91. ♀.  
*Pompilus argenteus* Cresson, 1867. Amer. Ent. Soc., Trans. 1: 93. ♂.  
*Nannopompilus argenteus* Ashmead, 1902. Canad. Ent. 34: 82.  
*Pompiloides minora* Banks, 1912 (1911). N. Y. Ent. Soc., Jour. 19: 227. ♀.  
**subangulatus** (Banks). Transcont., Huds. to Transit. Zone. Ecology: Occurs in sandy places, and on flowers of *Solidago* and *Spiraea*.  
*Sophropompilus subangulatus* Banks, 1919. Mus. Compar. Zool., Bul. 63: 237. ♀, ♂.  
*Psammochares (Sophropompilus) tebemi* Brimley, 1936. Elisha Mitchell Sci. Soc., Jour. 52: 127. ♀.

### Genus AGENIOIDEUS Ashmead

#### Genus AGENIOIDEUS Subgenus RIDESTUS Banks

- Ridestus* Banks, 1912 (1911). N. Y. Ent. Soc. Jour. 19: 223.  
 Type-species: *Psammochares transversalis* Banks. Orig. desig. (= *Psammochares biedermani* Banks).  
**biedermani** (Banks). L. Sonor. Fauna, entering U. Sonor., Kans., Utah, Oreg., Mont. ?, south into Mexico (Baja California, Chihuahua, Nuevo Leon, Hidalgo). Prey: *Lorosceles devius* Gertsch and Mulaik.  
*Pompilus mexicanus* Taschenberg, 1869. Ztschr. Ges. Naturw. 34: 52. ♀. Preocc.  
*Psammochares biedermani* Banks, 1910 (June). N. Y. Ent. Soc., Jour. 18: 116. ♂.  
*Psammochares striatulus* Banks, 1910 (June). N. Y. Ent. Soc., Jour. 18: 119. ♀.  
*Psammochares transversalis* Banks, 1910 (Dec.). Psyche 17: 248. ♀.  
*Arachnophroctonus anahuacensis* Bradley, 1944. Notulae Nat. 145: 10. N. name.  
 Biology: Evans, 1959. Kans. Ent. Soc., Jour. 32: 76 (prey transport).

Genus *AGENIOIDEUS* Subgenus *AGENIOIDEUS* Ashmead

*Agenioideus* Ashmead, 1902. *Canad. Ent.* 34: 85.

Type-species: *Pompilus humilis* Cresson. Orig. desig.

*Aporoideus* Ashmead, 1902. *Canad. Ent.* 34: 86.

Type-species: *Pompilus sericeus* Vander Linden. Orig. desig.

*humilis* (Cresson). Transit. to L. Austr. Zones, N. B. and B. C. to Fla. and Calif., south to Panama. Ecology: Nests in sandy places, and around cliffs, walls, and buildings in pre-existing crevices. Parasite: Bombyliidae sp.; Mutillidae sp. Prey: *Acacesia hamata* (Hentz), *Araneus cornutus* McC., A. sp., *Neosconella pegna* (Walck.), *Conepeira excelsa* (Bks.).

*Pompilus humilis* Cresson, 1867. *Amer. Ent. Soc., Trans.* 1: 91. ♀.

Taxonomy: Hurd, 1947. *Pan-Pacific Ent.* 23: 133. ♂.

Biology: Rau, 1922. *Acad. Sci. St. Louis, Trans.* 24: 15 (prey). —Hurd, 1947. *Pan-Pacific Ent.* 23: 132 (nest, parasites). —Krombein, 1953. *Brooklyn Ent. Soc., Bul.* 48: 113-115 (prey, nest). —Eberhard, 1971 (1970). *Psyche* 77: 243-247 (prey hunting).

Genus *AGENIOIDEUS* Subgenus *GYMNOCHARES* Banks

*Gymnochares* Banks, 1917. *Mus. Compar. Zool., Bul.* 61: 107, 108.

Type-species: *Psammochares birkmanni* Banks. Desig. by Pate, 1946.

*birkmanni* (Banks). Transcont. in L. Austr. Zone, entering U. Austr. in West. N. J., Kans.,

Wyo., and Oreg. southward in Mexico to Oaxaca. Prey: *Herpyllus vasifer* (Walck.).

*Psammochares birkmanni* Banks, 1910. *N. Y. Ent. Soc., Jour.* 18: 116. ♂.

*Gymnochares texana* Banks, 1944. *Mus. Compar. Zool., Bul.* 94: 170. ♀.

Biology: Kurczewski and Kurczewski, 1968. *Kans. Ent. Soc., Jour.* 41: 369 (prey).

Genus *SERICOPOMPILUS* Howard

*Sericopompilus* Howard, 1901. *Insect Book*, pl. XI, fig. 17.

Type-species: *Pompilus cinctipes* Cresson. Monotypic (= *Ceropales apicalis* Say).

*angustatus* (Cresson). L. and U. Austr. Zones of the Great Plains area; Tex. and N. Mex. to Wyo., S. Dak., and Mich.; in Mexico south to Jalisco and Guanajuato in Central Plateau.

*Pompilus angustatus* Cresson, 1865. *Ent. Soc. Phila., Proc.* 4: 452. ♀.

*Psammochares fulvoapicalis* Banks, 1910. *N. Y. Ent. Soc., Jour.* 18: 117. ♀.

*Sericopompilus fumosus* Banks, 1933. *Psyche* 40: 5. ♂.

*apicalis* (Say). Austrorip. and Carol. Faunas, Tex. and Fla. to Nebr., Mich., and Conn. Ecology: Nests in sand and soft earth. Parasite: Miltogrammini sp. Prey: *Phidippus audax* Hentz, *P. audax* var. *bryantae* Kast., *P. whitmanii* Peckh., *P. putnami* Peckh., *P. sp.*, *Paraphidippus chrysis* Walck., *Thiodina sylvana* (Hentz); *Thomisus* sp., *Xysticus ferox* (Hentz), *X. funestus* Keys., *Philodromus washita* Bks.; *Aysa gracilis* (Hentz); Lycosidae sp.; *Oxyopes scalaris* Hentz; *Eriophora ravilla* (Koch), *Acanthepeira stellata* (Walck.), *Eustala anastera* (Walck.), *Neoscona arabesca* (Walck.), *N. sp.*

*Ceropales apicalis* Say, 1835. *Boston Jour. Nat. Hist.* 1: 366. ♂.

*Pompilus fuscipennis* Lepeletier, 1845. *Hist. Nat. Ins., Hym.*, v. 3, p. 434. ♀. Preocc.

*Pompilus sordidus* Smith, 1855. *Cat. Hym. Brit. Mus.*, v. 3, p. 160. ♀. N. name.

*Pompilus cinctipes* Cresson, 1867. *Amer. Ent. Soc., Trans.* 1: 102. ♂. N. name.

Biology: Peckham and Peckham, 1898. *Wis. Geol. Nat. Hist. Survey, Bul.* 2: 140-144 (prey, nest). —Krombein, 1953. *Ent. Soc. Wash. Proc.* 55: 116-117 (prey, parasite). —Krombein, 1955. *Ent. Soc. Wash., Proc.* 57: 149 (prey). —Evans and Yoshimoto, 1955. *Kans. Ent. Soc., Jour.* 28: 17-18 (prey). —Krombein, 1958. *Ent. Soc. Wash., Proc.* 60: 101 (prey). —Krombein, 1959. *Ent. Soc. Wash., Proc.* 61: 193 (prey). —Evans and Yoshimoto, 1962. *Ent. Soc. Amer., Misc. Pub.* 3: 89-91 (prey, nest, parasite, life history). —Kurczewski and Kurczewski, 1973. *Kans. Ent. Soc., Jour.* 46: 66 (prey).

*neotropicalis* (Cameron). L. Austr. Zone, Calif., Ariz., Kans., Ark., Tex., Ala., Ga., Fla., and N. C., south to Costa Rica.

*Pompilus neotropicalis* Cameron, 1893. *Biol. Cent.-Amer., Hym.*, v. 2, p. 203. ♀.



- Pompilus guatemalensis* Cameron, 1893. Biol. Cent.-Amer., Hym., v. 2, p. 206. ♂.  
*Psammochares posticatus* Banks, 1910. N. Y. Ent. Soc., Jour. 18: 119. ♂.  
*Psammochares fuscipennis* var. *georgiana* Banks, 1911. Ent. Soc., Wash., Proc. 13: 238. ♀.

### Genus EPISYRON Schiodte

- Episyron* Schiodte, 1837. Kroyer's Naturhist. Tidsskr. 1: 341.  
 Type-species: *Sphex rufipes* Linnaeus. Monotypic.  
*Spilopompilus* Ashmead, 1902. Canad. Ent. 34: 81.  
 Type-species: *Pompilus biguttulatus* (!) Fabricius. Orig. desig.  
*Epizuron* (!) Ashmead, 1902. Canad. Ent. 34: 82.

These are extremely active wasps, two of which have been dubbed the "Tornado Wasp" and the "Hurricane Wasp" by the Peckhams. They nest in short burrows in sand, which they provision invariably with orb-weavers (Araneidae). They visit flowers of many kinds.

- biguttatus biguttatus** (Fabricius). Temperate N. Amer. east of the Rockies, Tex. and Fla. to Labr. and N. W. T. Ecology: Nests in sand. Parasite: *Miltogrammini* sp. Prey: *Araneus diadematus* Clerck, A. spp., *Eustala anastera* (Walck.), *Metepeira labyrinthica* (Hentz), *Neoscona benjamina* (Walck.), *N. sp.*, near *sacra* (Walck.), *N. sp.*  
*Pompilus biguttatus* Fabricius, 1798. Sup. Ent. System., p. 249. ♀.  
*Episyron atrytone* Banks, 1912 (1911). N. Y. Ent. Soc., Jour. 19: 229. ♀.

Biology: Peckham and Peckham, 1898. Wis. Geol. Nat. Hist. Survey, Bul. 2: 138-140 (prey transport). — Rau, 1922. Acad. Sci. St. Louis, Trans. 24: 9-10 (prey, nest, parasite). — Krombein, 1953. Wasmann Jour. Biol. 264-266 (nest, prey, parasite). — Krombein, 1953. Ent. Soc. Wash., Proc. 55: 115-116 (nest, prey). — Evans and Yoshimoto, 1962. Ent. Soc. Amer., Misc. Pub. 3: 93 (prey). — Kurczewski, 1963 (1962). Brooklyn Ent. Soc., Bul. 57: 88 (prey, nest). — Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 9 (prey). — Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 369 (prey). — Kurczewski and Kurczewski, 1973. Kans. Ent. Soc., Jour. 46: 66 (prey).

- biguttatus californicus** (Banks). U. Sonor. to Canad. Fauna, Calif. to B. C., Alta., and S. Dak. Prey: *Neoscona naiba* Chamb. and Gertsch.  
*Psammochares californica* Banks, 1910. N. Y. Ent. Soc., Jour. 18: 117. ♂.

Biology: Wasbauer and Powell, 1962. Kans. Ent. Soc., Jour. 35: 396 (prey).

- biguttatus montezuma** (Cameron). Ariz., N. Mex., west. Tex. south in Mexico to Morelos, Guerrero and Veracruz. Prey: *Neoscona naiba* Chamb. and Gertsch.  
*Pompilus montezuma* Cameron, 1893. Biol. Cent.-Amer., Hym., v. 2, p. 193, pl. 11, fig. 10. ♀.  
*Episyron arizonica* Banks, 1933. Psyche 40: 5. ♀.

Biology: Wasbauer and Powell, 1962. Kans. Ent. Soc., Jour. 35: 396 (prey).

- conterminus posterus** (Fox). N. Y. to Fla., west to south. Calif., Ill., south to Costa Rica. Ecology: Nests in sand. Parasite: *Senotainia* sp., *Miltogrammini* sp.; *Evagetus* sp. Prey: *Eustala anastera* (Walck.), *E. cepina* (Walck.), *E. sp.*, *Araneus ozarkensis* (Arch.), *A. sp.*, *Larinia* sp., *Neoscona arabesca* (Walck.), *N. vertebrata* McCook, *N. sp.*, *Neosconella pегina* (Walck.), *Argiope aurantia* Luc., *Drexelia directa* (Hentz), *Gea heptagon* (Hentz). Typical *conterminus* (Sm.) occurs in South America.  
*Pompilus posterus* Fox, 1893 (May). Canad. Ent. 25: 115. ♀, ♂.  
*Pompilus exactus* Cameron, 1893 (Sept.). Biol. Cent.-Amer., Hym., v. 2, p. 202. ♀, ♂.  
*Pompilus porus* Fox, 1894. Calif. Acad. Sci., Proc. (2) 4: 98. ♀, ♂.

Taxonomy: Evans, 1959. Ent. Soc. Amer., Ann. 52: 439 (larva).

Biology: Evans, 1950. Amer. Ent. Soc., Trans. 75: 225 (prey). — Krombein, 1953. Wasmann Jour. Biol. 10: 266-268 (prey, nest, parasite). — Krombein, 1955. Ent. Soc. Wash., Proc. 57: 149-150 (prey, nest). — Krombein, 1958. Ent. Soc. Wash., Proc. 60: 102 (prey, nest, parasite). — Krombein, 1959. Ent. Soc. Wash., Proc. 61: 194 (prey, nest). — Wasbauer and Powell, 1962. Kans. Ent. Soc., Jour. 35: 396 (prey). — Kurczewski, 1963. Fla. Ent. 46: 210-212 (prey, nest). — Krombein, 1964. Amer. Mus. Novitates 2201: 10-11 (prey, nest).

- Kurzewski and Kurzewski, 1968. *Kans. Ent. Soc., Jour.* 41: 9 (prey). —Kurzewski and Kurzewski, 1968. *Kans. Ent. Soc., Jour.* 41: 369 (prey). —Kurzewski and Kurzewski, 1973. *Kans. Ent. Soc., Jour.* 46: 66-67 (prey, nest, parasite).
- oregon** Evans. *Transit. and Canad. Fauna, Yukon and Alta. to Wyo., Colo. and Calif. Prey: Araneus trifolium* (Hentz).
- Episyrus oregon* Evans, 1950. *Amer. Ent. Soc., Trans.* 75: 231. ♀, ♂.
- Biology: Evans, 1970. *Mus. Compar. Zool., Bul.* 140: 481 (prey, transport).
- quinquenotatus hurdi** Evans. *Transit. and U. Sonor. Fauna, B. C. and Alta. to Utah and Calif.; Mexico (Baja California).* Prey: *Epeira* sp.
- Episyrus quinquenotatus hurdi* Evans, 1950. *Amer. Ent. Soc., Trans.* 75: 221. ♀, ♂.
- quinquenotatus quinquenotatus** (Say). *Canad. in U. Austr. Zone, N. S., Sask., and B. C. to Mont., Colo., Tex., and Ala. Ecology: Nests in sand. Parasite: Senotainia trilineata* (Wulp). Prey: *Metazygia wittfeldae* (McC.), *Araneus cornutus* Clerck, *A. patagiatus* Clerck, *A. diadematus* Clerck, *A. sp. near diadematus* Clerck, *A. thaddeus* (Hentz), *A. marmoreus* Clerck, *A. ozarkensis* (Arch.), *A. sp., Epeira displicata* Hentz, *E. foliata* Fourcr., *Singa eugeni* Levi, *Neoscona arabesca* (Walck.), *N. minima* (Camb.), *N. sp., Eustala anastera* (Walck.), *E. triflex* (Walck.), *E. cepina* (Walck.), *Allepeira stellata* (Walck.).
- Pompilus 5-notatus* Say, 1835. *Boston Jour. Nat. Hist.* 1: 304. ♀.
- Pompilus griseus* Provancher, 1882. *Nat. Canad.* 13: 35, 36. ♂.
- Taxonomy: Evans, 1959. *Ent. Soc. Amer., Ann.* 52: 439, fig. 46 (larva).
- Biology: Peckham and Peckham, 1898. *Wis. Geol. Nat. Hist. Survey, Bul.* 2: 126-138 (prey, nest). —Evans, 1950. *Amer. Ent. Soc., Trans.* 75: 220 (prey). —Evans and Yoshimoto, 1955. *Kans. Ent. Soc., Jour.* 28: 18 (prey). —Krombein, 1958. *Ent. Soc. Wash., Proc.* 60: 102 (prey). —Kurzewski, 1961. *Brooklyn Ent. Soc., Bul.* 56: 24 (prey transport). —Krombein, 1961. *Brooklyn Ent. Soc., Bul.* 56: 63 (prey, nest). —Evans and Yoshimoto, 1962. *Ent. Soc. Amer., Misc. Pub.* 3: 91-92 (prey, nest, parasite). —Evans, 1963. *Ent. News* 74: 238-239, fig. 2 (prey, nest). —Krombein, 1964. *Brooklyn Ent. Soc., Bul.* 58: 118 (prey, nest). —Kurzewski and Kurzewski, 1968. *Kans. Ent. Soc., Jour.* 41: 9-12 (prey). —Kurzewski and Kurzewski, 1968. *Kans. Ent. Soc., Jour.* 41: 370 (prey). —Evans, 1970. *Mus. Compar. Zool., Bul.* 140: 482 (prey). —Kurzewski and Kurzewski, 1973. *Kans. Ent. Soc., Jour.* 46: 67 (prey).
- snowi** (Viereck). *Transcont. in L. and U. Austr. Zones, n. to N. J., Ill., S. Dak., Mont., and Oreg.; Mexico (Baja California, Chihuahua, Durango).* Parasite: *Miltogrammini* sp. Prey: *Neoscona benjamina* (Walck.), *Cyclosa conica* (Pall.).
- Anoplius (Pompilinus) snowi* Viereck, 1906. *Amer. Ent. Soc., Trans.* 32: 202. ♂.
- Psammochares maneei* Banks, 1910. *N. Y. Ent. Soc., Jour.* 18: 117. ♀.
- Episyrus laevis* Banks, 1933. *Psyche* 40: 4. ♀.
- Biology: Rau, 1922. *Acad. Sci. St. Louis, Trans.* 24: 10 (prey transport). —Krombein, 1953. *Wasmann Jour. Biol.* 10: 268-269 (prey, nest, parasite). —Krombein, 1953. *Ent. Soc. Wash., Proc.* 55: 116 (prey, nest).

### Genus POECILOPOMPILUS Howard

*Poecilopompilus* Howard, 1901. *Insect Book*, pl. V. fig. 1, and pl. XI, fig. 18.

Type-species: *Pompilus navus* Cresson. *Desig.* by Ashmead, 1902 (= *Ceropales interrupta* Say).

*Batozonus* Howard, 1901. *Insect Book*, pl. XI, fig. 24.

Type-species: *Pompilus algidus* Smith. Monotypic.

*Batozonus* (!) Banks, 1912 (1911). *N. Y. Ent. Soc., Jour.* 19: 221, 224.

*Eubatozonus* Haupt, 1950. *Explor. Parc Nat. Albert, Mission de Witte*, fasc. 69, p. 52.

Type-species: *Eubatozonus pulcher* Haupt. *Orig. desig.*

Wasps of this genus, as in the closely related *Episyrus*, prey exclusively upon Araneidae, and nest in sandy places; they are also frequent visitors on flowers.

**algidus algidus** (Smith). Austrorip. and Carol. Fauna, Tex. and Fla. to Mass., Mich., and N. Dak.

*Pompilus algidus* Smith, 1855. Cat. Hym. Brit. Mus., v. 3, p. 158. ♀.

**algidus coquilletti** (Provancher). U. Sonor. Fauna, south. Calif. and N. Mex. to Utah and north. Calif.

*Pompilus coquilletti* Provancher, 1887. Addit. Corr. Fauna Ent. Canad., Hym., p. 261. ♂.

*Batazonus* (!) *flavipennis* Banks, 1921. Ent. Soc. Amer., Ann. 14: 20. ♀.

**algidus marcidus** (Smith). South. Tex. s. to Nicaragua.

*Pompilus marcidus* Smith, 1862. Jour. Ent. 1: 395. ♀.

*Pompilus pygidialis* Kohl, 1886. Zool.-Bot. Ges. Wien, Verhndl. 36: 314, 334. ♀.

**algidus willistoni** (Patton). S. Dak. and Colo. to N. Mex. and Ariz., s. in Mexico to Durango and Baja California.

*Pompilus willistoni* Patton, 1879. U. S. Geol. and Geog. Survey, Bul. 5: 352. ♀.

**flavopictus flavopictus** (Smith). South. Tex. to Surinam and Colombia. Other subsp. occur in the Antilles and Brazil.

*Pompilus flavopictus* Smith, 1862. Jour. Ent. 1: 396. ♀.

**interruptus cressoni** (Banks). North. Va. and east. Ohio to Mass. Ecology: Nests in sand. Prey: *Epeira trifolium* Hentz, *Argiope trifasciata* (Forsk.).

*Batazonus* (!) *interruptus* var. *cressoni* Banks, 1944. Mus. Compar. Zool., Bul. 94: 167. ♀, ♂.

Biology: Evans, 1950. Amer. Ent. Soc., Trans. 75: 253 (prey). —Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 12-13 (prey, nest).

**interruptus interruptus** (Say). Transcont. in L. and U. Austr. Zones, north to N. J., Ohio,

Mich., S. Dak., Utah, and south. Calif. Ecology: Nests in sand. Parasite: Miltogrammini

sp. Prey: *Neoscona benjamina* (Walck), *N. vertebrata* McCook, *N. sp.*, *Araneus cornutus* Cl., *A. trifolium* (Hentz), *Argiope aurantia* Luc., *A. trifasciata* (Forsk.), *Epeira foliata* (Fourcr.), *Acanthepeira stellata* Walck.; Lycosidae sp.

*Ceropales interrupta* Say, 1835. Boston Jour. Nat. Hist. 1: 365. ♂.

*Pompilus navus* Cresson, 1867. Amer. Ent. Soc., Trans. 1: 105. ♀, ♂.

*Pompilus ichneumoniformis* Patton, 1879. U. S. Geol. Survey, Bul. 5: 351. ♀. Preocc.

*Pompilus ichneumonoides* Dalla Torre, 1897. Cat. Hym., v. 8, p. 295. N. name.

Taxonomy: Evans, 1959. Ent. Soc. Amer., Ann. 52: 438, figs. 26-30 (larva).

Biology: Peckham and Peckham, 1898. Wis. Geol. Nat. Hist. Survey, Bul. 2: 152-153 (prey,

nest). —Krombein, 1953. Wasmann Jour. Biol. 10: 269-272 (nest, prey, parasite).

—Strandtmann, 1953. Kans. Ent. Soc., Jour. 26: 45-46 (prey). —Evans and Yoshimoto,

1955. Kans. Ent. Soc., Jour. 28: 18 (prey, nest). —Evans and Yoshimoto, 1962. Ent. Soc.

Amer., Misc. Pub. 3: 93-94 (nest, prey). —Kurczewski and Kurczewski, 1968. Kans. Ent.

Soc., Jour. 41: 13 (prey).

**interruptus semiflavus** Evans. Calif. (Central Valley).

*Poecilopompilus interruptus semiflavus* Evans, 1966. Amer. Ent. Soc., Mem. 20: 224. ♀, ♂.

### Genus TACHYPOMPILUS Ashmead

*Tachypompilus* Ashmead, 1902. Canad. Ent. 34: 83

Type-species: *Tachypompilus abbotti* Ashmead. Orig. desig. (= *Sphex analis* Fabricius).

*Arachnophroctonus* Ashmead, 1902. Canad. Ent. 34: 83. Preocc.

Type-species: *Ceropales ferruginea* Say. Orig. desig.

*Balanoderes* Haupt, 1929. Berlin Zool. Mus., Mitt. 15: 119, 155.

Type-species: *Sphex analis* Fabricius. Desig. by Haupt, 1929.

*Afropompilus* Arnold, 1936. Transvaal Mus., Ann. 18: 107.

Type-species: *Pompilus ignitus* Smith. Orig. desig.

*Zarachnophroctonus* Pate, 1946. Amer. Ent. Soc., Trans. 72: 130. N. name.

Wasps of this genus occur around walls, stone piles, and buildings, where they nest in crevices, supplying the nest with Lycosid and Pisaurid spiders; they also visit flowers.

- ferrugineus annexus** (Banks). Tex.; northeast. Mexico ? Ecology: Nests in loose dry soil beneath house. Prey: *Lycosa rabida* (Walck.), *L. antelucana* Mont.  
*Arachnophroctonus ferrugineus* var. *annexus* Banks, 1944. Mus. Compar. Zool., Bul. 94: 168. ♀.
- Biology: Strandtmann, 1953. Kans. Ent. Soc., Jour. 26: 46-48, fig. 1 (nest, prey). — Evans and Yoshimoto, 1962. Ent. Soc. Amer., Misc. Pub. 3: 87 (prey).
- ferrugineus ferrugineus** (Say). L. and U. Austr. Zones, east. Tex. and Fla. to N. J., Ohio, Minn., and Colo. Ecology: Nests in crevices in walls. Prey: *Lycosa helluo* Walck., *L. osceola* Wall., *L. rabida* Walck., *L. spp.*; *Dolomedes tenebrosus* Hentz, *D. sp.*  
*Ceropales ferruginea* Say, 1824. In Keating, Narr. Long's 2nd Exped., v. 2, p. 334. ♂.
- Biology: Rau and Rau, 1918. Wasp Studies Afield, pp. 78-83 (prey, nest). — Rau, 1922. Acad. Sci. St. Louis, Trans. 24: 12 (prey). — Evans, 1950. Amer. Ent. Soc., Trans. 75: 260 (prey). — Evans and Yoshimoto, 1962. Ent. Soc. Amer., Misc. Pub. 3: 87 (prey). — Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 13 (prey). — Kurczewski and Kurczewski, 1973. Kans. Ent. Soc., Jour. 46: 67 (prey).
- ferrugineus nigrescens** (Banks). North. Va. and west. N. Y. to N. H.  
*Arachnophroctonus ferrugineus* var. *nigrescens* Banks, 1944. Mus. Compar. Zool., Bul. 94: 169. ♀, ♂.
- ferrugineus torridus** (Smith). South. parts of Tex., N. Mex., Ariz., and Calif.; Mexico s. to Chiapas.  
*Pompilus torridus* Smith, 1862. Jour. Ent. 1: 396. ♀.  
*Arachnophroctonus ferrugineus* var. *unicolor* Banks, 1944. Mus. Compar. Zool., Bul. 94: 168. ♀. Preocc.  
*Tachypompilus ferrugineus Yavapai* Evans, 1950. Amer. Ent. Soc., Trans. 75: 263. N. name.
- unicolor cerinus** Evans. South. Calif., Utah, N. Mex. and Tex. s. to Costa Rica.  
*Tachypompilus unicolor cerinus* Evans, 1966. Amer. Ent. Soc., Mem. 20: 235, map 41. ♀, ♂.
- unicolor unicolor** (Banks). L. and U. Sonor. Faunas, Calif. and Utah, Wyo., Idaho, and B. C.  
*Arachnophroctonus unicolor* Banks, 1919. Mus. Compar. Zool., Bul. 63: 239, 240. ♀.  
*Arachnophroctonus latifrons* Banks, 1939. Canad. Ent. 71: 229. ♀, ♂.

### Genus ANOPLIUS Dufour

#### Genus ANOPLIUS Subgenus LOPHOPOMPILUS Radoszkowski

*Lophompilus* Radoszkowski, 1887. Soc. Ent. Rossica, Horae 21: 42.

Type-species: *Pompilus grandis* Eversmann. Desig. by Ashmead, 1902 (= *Sphex samariensis* Pallas).

*Pompilogaster* Howard, 1901. Insect Book, pl. V, fig. 19.

Type-species: *Pompilus aethiops* Cresson. Monotypic.

*Pompilogastra* Ashmead, 1902. Canad. Ent. 34: 81.

Type-species: *Pompilus aethiops* Cresson. Orig. desig.

Wide-ranging, strong-flying species which prey chiefly on Lycosidae and nest in tunnels in sand or soft earth. They are frequent visitors to flowers and occasionally come to light at night.

Revision: Regan, 1923. Ent. Soc. Amer., Ann. 16: 177-194.

- aethiops** (Cresson). N. S. to B. C. s. to Ga., Tex., Calif. in Transition to L. Austral Zones; Mexico (higher altitudes), Guatemala. Ecology: Occurs in fields, meadows, and prairies; commonly visits flowers; nests in pre-existing crevices in soft soil. Prey: *Lycosa frondicola* Em., *L. helluo* Walck., *L. gulosa* Walck., *L. carolinensis* Walck., *L. santrita* Chamb. and Ivie, *Schizocosa ocreata* (Hentz).  
*Pompilus aethiops* Cresson, 1865. N. Y. Ent. Soc., Jour. 4: 451. ♂ (♀ misdet.).  
*Psammochares ilione* Banks, 1910. Psyche 17: 249. ♀.  
*Lophompilus azotus* Banks, 1929. Psyche 36: 326. ♀.

- Biology: Evans, 1951. Amer. Ent. Soc., Trans. 76: 217 (ecology, prey). — Evans and Yoshimoto, 1962. Ent. Soc. Amer., Misc. Pub. 3: 70 (prey transport, nest). — Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 13 (prey transport, nest). — Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 46: 370 (prey transport). — Kurczewski and Kurczewski, 1973. Kans. Ent. Soc., Jour. 46: 68 (prey).
- atrox** (Dahlbom). L. and U. Austr. Zones, N. Mex. and Fla. to S. Dak., Ont., and Mass. Ecology: Occurs in fields, meadows and open woods; nests in sand or soft soil. Prey: *Lycosa rabida* Walck., *Dolomedes tenebrosus* Hentz, *D. urinator* Hentz. *Pompilus atrox* Dahlbom, 1843. Hym. Europaea, v. 1, p. 63. ♀.
- Biology: Peckham and Peckham, 1900. Wis. Nat. Hist. Soc., Bul. 1: 87 (prey). — Evans, 1951. Amer. Ent. Soc., Trans. 76: 224 (ecology, prey). — Krombein, 1955. Ent. Soc. Wash., Proc. 57: 150 (prey). — Krombein, 1959. Ent. Soc. Wash., Proc. 61: 194 (prey).
- bengtssoni** (Regan). Austrorip. and Carol. Faunas, Tex. and Fla. to S. Dak., Mich., and Mass. *Lophopompilus bengtssoni* Regan, 1923. Ent. Soc. Amer., Ann. 16: 185, 186. ♀, ♂.
- carolina** (Banks). Alleghanian Fauna, south. Que. to north. Ga. Ecology: Occurs in open woodlands, and on flowers of *Daucus carota*; nests in mammal burrows or in bare soil. Prey: *Wadotes hybridus* (Em.), *W. sp.*; *Amaurobius bennetti* (Blackw.). *Lophopompilus carolina* Banks, 1921. Ent. Soc. Amer., Ann. 14: 20. ♀.
- Taxonomy: Evans, 1959. Ent. Soc. Amer., Ann. 52: 442, fig. 50 (larva).
- Biology: Evans, 1951. Amer. Ent. Soc., Trans. 76: 222 (ecology, prey). — Krombein, 1958. Ent. Soc. Wash., Proc. 60: 53 (prey transport). — Krombein, 1961. Brooklyn Ent. Soc., Bul. 56: 63 (prey transport). — Evans and Yoshimoto, 1962. Ent. Soc. Amer., Misc. Pub. 3: 70-71 (prey transport, nest). — Kurczewski and Kurczewski, 1973. Kans. Ent. Soc., Jour. 46: 68 (prey).
- cleora** (Banks). P. E. I. to B. C., south to N. C., Ind., Tex., Ariz., mostly in U. and L. Austral Zones; Mexico (Baja California, Sonora, Jalisco, Puebla). Ecology: Nests in sand; rarely visits flowers. Parasite: *Senotainia litoralis* Allen. Prey: *Arctosa littoralis* (Hentz), *Lycosa helluo* Walck., *Trochosa avara* Keys., *T. sp.* *Psammochares cleora* Banks, 1917. Mus. Compar. Zool., Bul. 61: 105. ♀.
- Biology: Krombein, 1952. Amer. Ent. Soc., Trans. 78: 93 (prey). — Krombein, 1953. Ent. Soc. Wash., Proc. 55: 116 (prey). — Evans and Yoshimoto, 1955. Kans. Ent. Soc., Jour. 28: 18 (prey, nest). — Krombein, 1958. Ent. Soc. Wash., Proc. 55: 116 (prey). — Evans and Yoshimoto, 1962. Ent. Soc. Amer., Misc. Pub. 3: 69-70 (prey transport, nest, parasite). — Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 13-14 (prey). — Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 371 (prey). — Kurczewski and Kurczewski, 1973. Kans. Ent. Soc., Jour. 46: 68 (prey).

### Genus ANOPLIUS Subgenus NOTIOCHARES Banks

*Notiochares* Banks, 1917. Mus. Compar. Zool., Bul. 61: 107, 108.

Type-species: *Pompilus philadelphicus* Lepeletier. Monotypic (= *Sphex amethystina* Fabricius).

**amethystinus amethystinus** (Fabricius). Southern Fla., Ariz., Calif. south to Panama. Prey:

*Lycosa sp.* Another subsp. occurs in South America.

*Sphex amethystina* Fabricius, 1793. Ent. System., Emend. et Aucta, v. 2, p. 210. ♀.

*Pompilus anceps* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 130. ♂. Preocc.

*Pompilus cubensis* Cresson, 1867. Amer. Ent. Soc., Trans. 1: 93. N. name.

*Pompilus propinquus* Fox, 1891. Amer. Ent. Soc., Trans. 18: 339. ♀. Preocc.

*Pompilus dux* Dalla Torre, 1897. Cat. Hym., v. 8, p. 286. N. name.

*Pompilus amethystinoides* Strand, 1911. Arch. f. Naturges., v. 77, bd. 1, sup. 2, p. 147. N. name for *amethystinus* Tasch., believed to differ from *amethystinus* F.

*Psammochares philadelphicus* var. *floridensis* Banks, 1917. Mus. Compar. Zool., Bul. 61: 106. ♀.

**lepidus atramentarius** (Dahlbom). Southern New England, Ohio and Nebr. to Fla. and Tex. in Austroriparian and Carolinian Faunas; Mexico (Coahuila, Durango). Ecology: Nests in sand and firm soil; visits many flowers. Prey: *Lycosa rabida* (Walck.), *L. avida* Walck.,

*L. antelucana* Mont., *L. sp.*, *Arctosa littoralis* (Hentz). Typical *lepidus* (Say) occurs from Mexico to British Guiana and Ecuador.

*Pompilus atramentarius* Dahlbom, 1843. Hym. Europaea, v. 1, p. 48.

*Pompilus philadelphicus* Lepeletier, 1845. Hist. Nat. Ins., Hym., v. 3, p. 423. ♀.

*Pompilus philadelphicus* var. *sericatus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 202. ♀.

*Sericopompilus plutonis* Banks, 1912 (1911). N. Y. Ent. Soc., Jour. 19: 228. ♂.

*Notiochares angusticeps* Banks, 1939. Canad. Ent. 71: 227. ♀.

Biology: Rau, 1922. Acad. Sci. St. Louis, Trans. 24: 13-15 (prey, nest). — Evans, 1951. Amer. Ent. Soc., Trans. 76: 233-234 (prey). — Evans and Yoshimoto, 1955. Kans. Ent. Soc., Jour. 28: 18 (prey). — Evans and Yoshimoto, 1962. Ent. Soc. Amer., Misc. Pub. 3: 71-72 (prey transport, nest).

### Genus ANOPLIUS Subgenus ANOPLIODES Banks

*Anopliodes* Banks, 1939. Canad. Ent. 71: 225, 226.

Type-species: *Anopliodes modestus* Banks. Monotypic (= *Anoplius bolli* Banks).

**bolli** Banks. Tex. to Kans., Mo., and N. J.; Mexico (Tamaulipas).

*Anoplius bolli* Banks, 1917. Mus. Compar. Zool., Bul. 61: 104. ♂.

*Anopliodes modestus* Banks, 1939. Canad. Ent. 71: 226. ♀.

**parsonsi** (Banks). South. Fla.; Cuba, Mexico south to Costa Rica.

*Psammochares parsonsi* Banks, 1944. Mus. Compar. Zool., Bul. 94: 183. ♀.

### Genus ANOPLIUS Subgenus ARACHNOPHROCTONUS Howard

*Arachnophroctonus* Howard, 1901. Insect Book, pl. VII, figs. 11, 14.

Type-species: *Spheg tropica* Fabricius. Desig. by Pate, 1946.

*Arachnophila* Ashmead, 1902. Canad. Ent. 34: 86. Preocc.

Type-species: *Pompilus divisus* Cresson. Orig. desig.

*Anoplinellus* Banks, 1934. Amer. Acad. Arts and Sci., Proc. 69: 84.

Type-species: *Pompilus clotho* Smith. Monotypic.

*Arachnodaictes* Pate, 1946. Amer. Ent. Soc., Trans. 72: 74. N. name.

Day (1974) synonymized the subgenus *Pompilinus* Ashm. under the subgenus *Arachnophroctonus* How. This action was taken too late to be used in this edition of the catalog.

The wasps of this group inhabit sandy places, where they nest in short burrows in the earth, stocking their burrows with errant spiders of several families. They visit flowers of many kinds.

Taxonomy: Day, 1974. Brit. Mus. (Nat. Hist.), Ent., Bul. 30: 379-380 (subgeneric syn.). — Day, 1974. Brit. Mus. (Nat. Hist.), Ent. Bul. 31: 49-51 (identity of *Anoplinellus* Bks.).

**acapulcoensis** (Cameron). L. Austr. Zone, Ariz. to Fla. and south. N. J., south to Guatemala.

Ecology: Visits flowers of many kinds.

*Pompilus acapulcoensis* Cameron, 1893. Biol. Cent.-Amer., Hym., v. 2, p. 198. ♂.

*Psammochares bellicosus* Banks, 1912 (1911). N. Y. Ent. Soc., Jour. 19: 224. ♂.

*Lophopompilus autilone* Banks, 1919. Canad. Ent. 51: 82. ♂.

**americanus ambiguus** (Dahlbom). Tropical and L. Austr. Zones, Greater Antilles and Panama to Calif., Utah, Kans., and Ala. Ecology: Nests in sand-clay soil. Parasite: *Evagetes mohave* (Bks.). Prey: *Arctosa littoralis* (Hentz), *Lycosa* spp., *Schizocosa crassipes* Walck.; *Peucetia viridans* Hentz.

*Pompilus ambiguus* Dahlbom, 1845. Hym. Europaea, sup. 1, p. 452. ♀.

*Pompilus coruscus* Smith, 1855. Cat. Hym. Brit. Mus., v. 3, p. 156. ♀.

*Pompilus juxta* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 128. ♀.

*Pompilus subargenteus* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 129. ♂.

*Anoplius puella* Banks, 1941. Canad. Ent. 73: 121. ♂.

*Pompilinus orthodes* Banks, 1944. Zool. 29: 112. ♀.

*Anoplius varunus* Banks, 1947. Mus. Compar. Zool., Bul. 99: 419. ♂.

Biology: Evans, 1951. Amer. Ent. Soc., Trans. 76: 270 (prey transport, nest, parasite).

— Evans and Yoshimoto, 1955. Kans. Ent. Soc., Jour. 28: 18 (prey, nest). — Hurd and

Wasbauer, 1956. Kans. Ent. Soc., Jour. 29: 169 (prey). — Evans and Yoshimoto, 1962. Ent.

- Soc. Amer., Misc. Pub. 3: 76-77 (prey transport, nest). — Wasbauer and Powell, 1962. Kans. Ent. Soc., Jour. 35: 397 (prey).
- americanus americanus** (Palisot de Beauvois). Cent. Tex. and north. Ga. to S. Dak., Minn., south Ont., and southeast. N. Y. Ecology: Nests in clay. Prey: *Pardosa milvina* (Hentz), *P. sp.*; *Philodromus* sp.
- Pompilus americanus* Palisot de Beauvois, 1811. Ins. Afr. Amer., p. 117. ♀.
- Pompilus plebejus* Dahlbom, 1845. Hym. Europaea, v. 1, p. 60. ♀.
- Psammochares albomarginatus* Banks, 1910. N. Y. Ent. Soc., Jour. 18: 114. ♂.
- Pompiloides agnema* Brimley, 1928. Elisha Mitchell Sci. Soc., Jour. 43: 204. ♂.
- Biology: Rau, 1922. Acad. Sci. St. Louis, Trans. 24: 10-11 (prey transport, nest). — Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 15 (prey).
- americanus trifasciatus** (Palisot de Beauvois). Austrorip. Fauna, N. C., Ga. and Fla. Prey: *Geolycosa hubbelli* Wall.
- Pompilus trifasciatus* Palisot de Beauvois, 1811. Ins. Afr. Amer., p. 118. ♀.
- Psammochares eurydice* Banks, 1921. Ent. Soc. Amer., Ann. 14: 19. ♀.
- Biology: Kurczewski, 1963. Fla. Ent. 46: 212 (prey).
- apiculatus apiculatus** (Smith). Tropical and L. Sonor. Zones, south Calif., Ariz., and cent. Tex. to Panama. Ecology: Occurs along sandy streambanks and seashores.
- Pompilus apiculatus* Smith, 1855. Cat. Hym. Brit., Mus., v. 3, p. 157. ♀.
- Pompilus coruscus* Smith, 1879. Descr. New Species Hym. Brit. Mus., p. 155. ♀. Preocc.
- Arachnophroctonus apiculatus hondurensis* Dreisbach, 1954. Amer. Midland Nat. 52: 439. ♂.
- apiculatus autumnalis** (Banks). Austrorip. and Carol. Faunas, Tex. and Fla. to Ga., west. N. Y., south. Ont., Minn., and Kans. Ecology: Nests in sand. Parasite: *Evageles mohave* (Bks.). Prey: *Arctosa littoralis* (Hentz).
- Pompiloides autumnalis* Banks, 1914. N. Y. Ent. Soc., Jour. 22: 301. ♀.
- Taxonomy: Evans, 1959. Ent. Soc. Amer., Ann. 52: 442, fig. 49 (larva).
- Biology: Evans, Lin and Yoshimoto, 1953. N. Y. Ent. Soc., Jour. 61: 61-78 (prey transport, nest, parasite, life history). — Evans and Yoshimoto, 1955. Kans. Ent. Soc., Jour. 28: 18 (prey). — Evans and Yoshimoto, 1962. Ent. Soc. Amer., Misc. Pub. 3: 74-75 (prey transport, nest, parasite). — Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 15 (prey). — Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 371 (prey). — Kurczewski and Kurczewski, 1973. Kans. Ent. Soc., Jour. 46: 68 (prey, nest).
- apiculatus pretiosus** (Banks). Coastal plain, Fla. to Maine. Ecology: Nests in sand, especially along bodies of water. Parasite: *Senotainia littoralis* Allen. Prey: *Arctosa littoralis* (Hentz), *Lycosa helluo* (Walck.).
- Psammochares pretiosa* Banks, 1910. N. Y. Ent. Soc., Jour. 18: 119. ♂.
- Pompiloides autumnalis* var. *atlanticus* Banks, 1914. N. Y. Ent. Soc., Jour. 22: 301. ♀.
- Taxonomy: Evans, 1959. Ent. Soc. Amer., Ann. 52: 442 (larva).
- Biology: Krombein, 1953. Wasmann Jour. Biol. 10: 272-275 (prey, nest, life history, parasite). — Krombein and Evans, 1954. Ent. Soc. Wash., Proc. 56: 230 (prey). — Krombein, 1959. Ent. Soc. Wash., Proc. 61: 194 (prey). — Krombein, 1964. Amer. Mus. Novitates 2201: 11 (nest, prey). — Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 15-16, fig. 3 (prey, nest).
- marginalis** (Banks). Ariz., Tex., and Fla. to Utah, Man., south. Ont., and Mass. Ecology: Nests in sand. Parasite: *Evageles mohave* (Bks.). Prey: *Geolycosa pikei* (Marx), *G. wrighti* Em., *G. missouriensis* Bks., *G. spp.*, *Lycosa baltimoriana* Keys., *L. carolinensis* Walck., *L. frondicola* Em., *L. avida* Walck., *L. sp.* near *lenta* Hentz, *L. sp.* near *ceratiola* Gertsch and Wall., *L. spp.*, *Arctosa littoralis* Hentz; *Pellenes coronatus* (Hentz).
- Sphex tropica* Fabricius, 1775. Systema Ent., p. 350. ♀. Preocc.
- Psammochares marginalis* Banks, 1910 (June). N. Y. Ent. Soc., Jour. 18: 118. ♀, ♂.
- Psammochares castella* Banks, 1910 (Dec.). Psyche 17: 248. ♂.
- Psammochares fabricii* Banks, 1933. Psyche 40: 6. N. name.
- Taxonomy: Evans, 1959. Ent. Soc. Amer., Ann. 52: 441, figs. 31-34, 48 (larva).

- Biology: Rau and Rau, 1918. Wasp Studies Afield, pp. 45-58 (prey, nest). — Krombein, 1953. Wasmann Jour. Biol. 10: 275-276 (prey, nest, life history). — Krombein, 1953. Ent. Soc. Wash., Proc. 55: 116-117 (prey, nest). — Evans and Yoshimoto, 1955. Kans. Ent. Soc., Jour. 28: 18 (prey, nest). — Krombein, 1958. Ent. Soc. Wash., Proc. 60: 102-103 (prey, nest). — Evans and Yoshimoto, 1962. Ent. Soc. Amer., Misc. Pub. 3: 73-74 (nest, prey, parasite). — Wasbauer and Powell, 1962. Kans. Ent. Soc., Jour. 35: 397 (prey). — Kurczewski, 1963 (1962). Brooklyn Ent. Soc., Bul. 57: 88-89 (prey). — Krombein, 1964. Amer. Mus. Novitates 2201: 11-13 (prey, nest). — Kurczewski and Kurczewski, 1973. Kans. Ent. Soc., Jour. 46: 68 (prey, nest, parasite).
- moestus** (Banks). L. Sonor. Fauna, east. Tex. to southeast. Ariz.; Mexico.  
*Pompiloides moestus* Banks, 1912 (1911). N. Y. Ent. Soc., Jour. 19: 226. ♀.  
*Anoplius comanche* Banks, 1941. Canad. Ent. 73: 121. ♂.
- occidentalis** (Dreisbach). Calif. (Redwood City).  
*Arachnoproctonus occidentalis* Dreisbach, 1954. Amer. Midland Nat. 52: 437, figs. 13, 17. ♂.
- relativus** (Fox). Mass., Ont. and B. C. to Fla., Tex. and Calif., mostly in U. and L. Austral Zones, south in Mexico at higher altitudes to Oaxaca and Guerrero. Ecology: Occurs in fields and prairies; nests in sand and heavier soil. Prey: *Lycosa rabida* Walck., *L. antelucana* Mont., *Arctosa littoralis* (Hentz), *Geolycosa missouriensis* (Bks.), *G. sp.*; *Agelenopsis naevia* (Walck.), *A. pennsylvanica* (Koch).  
*Pompilus relativus* Fox, 1893. Canad. Ent. 25: 114. ♀.  
*Psammochares (Allocephonyx) hesione* Banks, 1910. Psyche 17: 250. ♂.  
*Psammochares difficilis* Banks, 1917. Mus. Compar. Zool., Bul. 61: 105. ♀.  
*Anoplius confraternus* Banks, 1926. Canad. Ent. 58: 201. ♀.  
*Psammochares henshawi* Banks, 1939. Canad. Ent. 71: 226. ♀.  
*Arachnoproctonus (?) variegatus* Dreisbach, 1957. Ent. News 68: 72, 2 figs. ♂.
- Biology: Evans, 1951. Amer. Ent. Soc., Trans. 76: 251-252 (nest, prey). — Evans and Yoshimoto, 1955. Kans. Ent. Soc., Jour. 28: 18 (nest, prey). — Evans and Yoshimoto, 1962. Ent. Soc. Amer., Misc. Pub. 3: 72-73 (prey, nest). — Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 14-15 (prey, nest). — Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 371-372 (prey hunting). — Kurczewski and Kurczewski, 1973. Kans. Ent. Soc., Jour. 46: 68-69 (prey, nest).
- semirufus** (Cresson). Tex. and Fla. to Mont., Man., and N. B. Ecology: Nests in sand. Prey: *Lycosa gulosa* Walck., *L. rabida* Walck., *L. punctulata* Hentz, *L. avida* Walck., *L. spp.*, *Schizocosa crassipalpis* (Em.), *S. crassipes* (Walck.), *S. saltatrix* (Hentz), *S. bilineata* (Em.), *S. ocreata* (Hentz), *S. spp.*, *Pardosa milvina* Hentz, *P. falcifera* Camb., *P. sp.* near *modica* (Blackw.), *P. distincta* (Blackw.), *P. sp.* near *floridana* Bks., *P. spp.*, *Trochosa pratensis* (Em.), *T. avara* Keys.; *Agelenopsis pennsylvanica* (Koch), *A. sp.*; *Amaurobius sp.*  
*Pompilus semirufus* Cresson, 1867. Amer. Ent. Soc., Trans. 1: 100. ♀.  
*Pompilus divinus* Cresson, 1867. Amer. Ent. Soc., Trans. 1: 100. ♀.
- Taxonomy: Evans, 1959. Ent. Soc. Amer., Ann. 52: 442 (larva).
- Biology: Krombein, 1953. Wasmann Jour. Biol. 10: 277-280 (prey, nest, life history). — Evans, 1953. Syst. Zool. 2: 168-169 (nest, prey). — Evans and Yoshimoto, 1955. Kans. Ent. Soc., Jour. 28: 18 (prey, nest). — Krombein, 1958. Ent. Soc. Wash., Proc. 60: 103 (prey, nest). — Krombein, 1959. Ent. Soc. Wash., Proc. 61: 194 (prey). — Evans and Yoshimoto, 1962. Ent. Soc. Amer., Misc. Pub. 3: 75-76 (prey, nest, life history). — Kurczewski, 1963. Brooklyn Ent. Soc., Bul. 57: 89 (prey transport). — Evans, 1964. Kans. Ent. Soc., Jour. 37: 306 (prey transport). — Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 16-18 (prey). — Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 372 (prey). — Kurczewski and Kurczewski, 1973. Kans. Ent. Soc., Jour. 46: 69 (nest, prey).
- xerophilus** Evans. L. Sonor. Fauna, Tex., N. Mex., to cent. Calif. and Utah; Mexico (Baja California).  
*Anoplius xerophilus* Evans, 1947. Ent. News 58: 10. ♀, ♂.  
*Arachnoproctonus gaigei* Dreisbach, 1954. Amer. Midland Nat. 52: 438, figs. 4, 11. ♂.



## Genus ANOPLIUS Subgenus POMPILINUS Ashmead

*Psammochares* Latreille, 1796. *Precis Caract. Gen. Ins.*, p. 115. Suppressed by Internatl.

Comn. Zool. Nomencl., Op. 166, 1945.

*Pompilinus* Ashmead, 1902. *Canad. Ent.* 34: 85.

Type-species: *Pompilus cylindricus* Cresson. Orig. desig.

*Anopliella* Banks, 1939. *Canad. Ent.* 71: 225, 227.

Type-species: *Pompilus tenebrosus* Cresson. Orig. desig.

Day (1974) synonymized the subgenus *Pompilinus* Ashm. under the subgenus *Arachnophroc-tonus* How. This action was published too late to be used in this edition of the catalog.

Wasps of this group inhabit gardens, waste places, clay banks, and sandy areas; they prey upon a wide variety of spiders and nest in short galleries in the earth.

Revision: Dreisbach, 1949. *Ent. Amer. (n. s.)* 29: 12-58.

Taxonomy: Day, 1974. *Brit. Mus. (Nat. Hist.), Ent.*, Bul. 30: 379-380 (subgeneric syn.).

*californiae* Evans. L. Sonor. Fauna, N. Mex. to Calif.; Mexico (Sonora, Baja California).

Ecology: Has been taken on *Helianthus* and *Tamarix*.

*Anoplius (Pompilinus) californiae* Evans, 1948. *Pan-Pacific Ent.* 24: 128. ♀, ♂.

*clystera* (Banks). L. and U. Sonor. Fauna, Tex. and south. Calif. to Colo. and cent. Calif.;

Mexico (Chihuahua, Baja California). Prey: *Lycosa* sp.

*Pompiloides clystera* Banks, 1914. *N. Y. Ent. Soc., Jour.* 22: 302. ♂.

*Pompilinus submarginatus* Dreisbach, 1952. *Amer. Midland Nat.* 48: 146, figs. 14, 17. ♂.

Taxonomy: Evans, 1968. *Ent. News* 79: 254-255, fig. 4 (redescription female).

Biology: Wasbauer and Powell, 1962. *Pan-Pacific Ent.* 35: 398 (prey).

*cylindricus* (Cresson). Conn., south. Ont., N. W. T., cent. Oreg. s. to Fla., Tex. and Calif.; Mexico

(Chihuahua). Ecology: Nests in sandy places. Prey: *Geolycosa wrightii* (Em.), *G. sp.*

*Pompilus cylindricus* Cresson, 1867. *Amer. Ent. Soc., Trans.* 1: 92. ♂.

*Arachnophila brevihirta* Banks, 1945. *Psyche* 52: 105. ♀.

*Pompilinus truncatus* Dreisbach, 1949. *Ent. Amer. (n. s.)* 29: 15. ♂.

*Pompilinus subtruncatus* Dreisbach, 1949. *Ent. Amer. (n. s.)* 29: 17. ♂.

*Pompilinus hispidus* Dreisbach, 1949. *Ent. Amer. (n. s.)* 29: 23. ♂.

*Pompilinus clavipes* Dreisbach, 1958. *Ent. News* 69: 61, figs. ♂.

Biology: Kurczewski and Kurczewski, 1968. *Kans. Ent. Soc., Jour.* 41: 19 (prey).

—Kurczewski and Kurczewski, 1973. *Kans. Ent. Soc., Jour.* 46: 69 (prey).

*estellina* (Banks). U. Sonor. and Transit. Faunas, Calif. and N. Mex. to Alta., s. to Guatemala.

Ecology: Nests in pre-existing crevices or burrows in soil. Prey: *Lycosidae* sp. ?

*Pompiloides estellina* Banks, 1914. *N. Y. Ent. Soc., Jour.* 22: 303. ♂, (♀ misdet.).

*Pompilinus utahensis* Dreisbach, 1952. *Amer. Midland Nat.* 48: 145, figs. 15, 16. ♂.

*Pompilinus minutus* Dreisbach, 1952. *Amer. Midland Nat.* 48: 147, figs. 7, 8. ♂.

Biology: Evans, 1964. *Kans. Ent. Soc., Jour.* 37: 305-306 (prey, nest).

*fraternus* (Banks). L. and U. Austr. Zones, N. Mex. and Fla. to Colo., Nebr., and southeast. N.

Y.; Mexico (Tamaulipas, Sonora). Ecology: Nests on protected beaches and on elevated

salt flats inland in pre-existing crevices or burrows. Parasite: *Ephuta s. sabaliana*

Schus. Prey: *Lycosa watsoni* Gertsch, *L. carrana* Bryant, *Sosippus floridanus* Sim.,

*Pardosa longispinnata* Tull.; *Habronattus* sp., *Pellenes* sp.

*Lophopompilus fraternus* Banks, 1941. *Canad. Ent.* 73: 120. ♀.

*Pompilinus dowi* Dreisbach, 1949. *Ent. Amer. (n. s.)* 29: 12. ♂.

Taxonomy: Evans, 1959. *Ent. Soc. Amer., Ann.* 52: 440, figs. 35-37 (larva).

Biology: Krombein and Evans, 1954. *Ent. Soc. Wash., Proc.* 56: 231 (prey transport, nest).

—Evans, Krombein, and Yoshimoto, 1955. *Brooklyn Ent. Soc., Bul.* 50: 77-84, 3 figs.

(hunting behavior, prey, nest, life history).

*insolens* (Banks). Transcont. in Transit. and U. Austr. Zones, Maine, Ont. and B. C. s. to Ga.,

Tex. and Calif., s. in Mexican central plateau to Veracruz and Morelos. Prey: *Maevia vittata* (Hentz).

*Pompiloides insolens* Banks, 1912 (1911). *N. Y. Ent. Soc., Jour.* 19: 226. ♂.

**krombeini** Evans. Austrorip. Fauna, Fla. to N. J. Ecology: Nests in sand. Prey: *Pardosa floridana* Bks., *Schizocosa* sp.

*Anoplus (Pompilinus) krombeini* Evans, 1950. Kans. Ent. Soc., Jour. 23: 88. ♀, ♂.

Taxonomy: Evans, 1959. Ent. Soc. Amer., Ann. 52: 440-441 (larva).

Biology: Krombein, 1953. Ent. Soc. Wash., Proc. 55: 117-118 (prey, nest). — Evans and Yoshimoto, 1962. Ent. Soc. Amer., Misc. Pub. 3: 80 (prey transport, nest, life history). — Kurczewski and Kurczewski, 1973. Kans. Ent. Soc., Jour. 46: 69 (prey).

**leona** (Cameron). West. Tex. to Ariz., south to El Salvador.

*Pompilus leona* Cameron, 1893. Biol. Cent.-Amer., Hym., v. 2, p. 198, pl. 11, fig. 20. "♂" = ♀.

*Anoplus (Pompilinus) grandiflexionis* Evans, 1950. Kans. Ent. Soc., Jour. 23: 84. ♀, ♂.

**marginatus** (Say). L. Austr. to Canad. Zone, Ariz., Colo., and Alta. east to the Atlantic.

Ecology: Nests in sand, gravel and other light soils. Parasite: *Evagetes parvus* (Cr.) ?

Prey: *Odiellus pictus* (Wood); *Argiope aurantia* Luc.; *Agelenopsis naevia* (Walck.), *A. pennsylvanica* (Koch), *Pellenes borealis* (Bks.), *P. viridipes* (Hentz), *P. sp.*, *Arctosa emertoni* Gertsch, *Geolycosa fatifera* Comst., *Lycosa avida* Walck., *L. domifer* Hancock; *Pardosa zazatilis* (Hentz), *P. sp.*, *Pirata insularis* Em., *Schizocosa crassipes* Walck., *S. sp.*, *Trochosa avara* (Keys.), *T. pratensis* (Em.), *T. sp.*; *Callilepis imbecillus* (Keys.), *Drassodes neglectus* (Keys.), *Drassylus niger* (Bks.), *Gnaphosa muscorum* (Koch), *G. sp.*, *Haplodrassus signifer* (Koch), *Herpyllus vasifer* (Walck.); *Castianeira longipalpus* (Hentz), *Clubiona kastoni* Gertsch, *C. mixta* Em., *C. sp.*; *Anypaena* sp.; *Philodromus infuscatus* Keys., *P. washita* Bks., *Thanatus formicinus* (Oliv.), *Tibellus duttoni* (Hentz), *Xysticus bicuspid* Keys., *X. elegans* Keys., *X. ferox* (Hentz), *X. funestus* Keys.; *Evarcha hoyi* (Peckh.), *Habrocestum decorus* (Blackw.), *Maevia vittata* (Hentz), *Phidippus audax* (Hentz), *P. clarus* Keys., *P. purpuratus* Keys.; *Amaurobius bennetti* (Blackw.). Females of *bequaerti* (Dreis.), *rectangularis* (Dreis.) and *townesi* Evans are unknown and are probably confused with females of *marginatus*; accordingly, some of the prey records and biological references may refer to one of the former three taxa.

*Pompilus marginatus* Say, 1824. In Keating's, Narr. Long's 2nd Exped., v. 2, p. 333. ♀.

*Pompilus (Miscus) petiolatus* Say, 1835. Boston Jour. Nat. Hist. 1: 305. ♀.

*Pompiloides reducta* Banks, 1914. N. Y. Ent. Soc., Jour. 22: 302. ♀.

*Pompiloides hageni* Banks, 1919. Mus. Compar. Zool., Bul. 63: 235. ♀.

*Pompilinus basirufus* Dreisbach, 1952. Amer. Midland Nat. 48: 149, figs. 9, 10. ♂ (♀ misdet.).

*Pompilinus basirufous* (!) Dreisbach, 1952. Amer. Midland Nat. 48: 158.

Taxonomy: Evans, 1959. Ent. Soc. Amer., Ann. 52: 440, fig. 39 (larva).

Biology: Peckham and Peckham, 1898. Wis. Geol. Nat. Hist. Survey, Bul. 2: 144-152 (prey transport, nest). — Hartman, 1905. Tex. Univ., Bul. 65: 52-54 (prey, nest). — Rau and Rau, 1918. Wasp Studies Afield, pp. 58-63 (prey hunting, transport). — Evans, 1948. Ent. News 59: 183-184 (prey, nest). — Evans, 1950. Amer. Ent. Soc., Trans. 75: 164 (parasite). — Krombein, 1953. Wasmann Jour. Biol. 10: 280-281 (prey, nest). — Evans and Yoshimoto, 1955. Kans. Ent. Soc., Jour. 28: 19 (prey). — Krombein, 1959. Ent. Soc. Wash., Proc. 61: 194 (prey). — Evans and Yoshimoto, 1962. Ent. Soc. Amer., Misc. Pub. 3: 78-80 (prey transport, nest, life history). — Kurczewski, 1963 (1962). Brooklyn Ent. Soc., Bul. 57: 89 (prey transport). — Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 19-20 (prey). — Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 373-374 (prey). — Kurczewski and Kurczewski, 1973. Kans. Ent. Soc., Jour. 46: 69-70, fig. 1 (prey, nest).

**percitus** Evans. Austrorip. and Carol. Faunas, Tex. to Mass. Prey: *Trochosa* sp. probably *gosiuta* Chamb., immature.

*Anoplus (Pompilinus) percitus* Evans, 1950. Kans. Ent. Soc., Jour. 23: 85. ♀, ♂.

**rectangularis gillaspys** Evans. Tex., N. C., N. J. in Austrorip. Fauna.

*Anoplus (Pompilinus) rectangularis gillaspys* Evans, 1951. Amer. Ent. Soc., Trans. 76: 310, fig. 101. ♂.

**rectangularis rectangularis** (Dreisbach). Transit. and U. Austr. Zones, Mass. to Minn., s. to Colo., Kans., Ohio and N. C. Prey: *Lycosa avida* Walck., *Schizocosa* sp., *Pardosa*

*distincta* (Blackw.); *Xysticus elegans* Keys., *X. ferox* (Hentz); *Phidippus whitmanii* Peckh.

*Pompilinus rectangularis* Dreisbach, 1949. Ent. Amer. (n. s.) 29: 18. ♂.

Biology: Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 20-21 (prey).

—Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 374 (prey). —Kurczewski and Kurczewski, 1973. Kans. Ent. Soc., Jour. 46: 70 (prey).

**splendens** (Dreisbach). L. and U. Austr. Zones, Fla., Tex., and Ariz. to Alta., Man., Ont., and Maine; Mexico (Chihuahua, Durango). Ecology: Nests in sandy areas. Prey: *Agelenopsis pennsylvanica* (Koch), A. spp.; *Araneus patagiatius* Clerck; *Pisaurina mira* (Walck.); *Amaurobius bennetti* (Blackw.); *Pardosa distincta* (Blackw.), *P. milvina* (Hentz), *P. sp. near floridana* Bks., *Schizocosa crassipes* (Walck.), *S. saltatrix* (Hentz), *S. sp.*, *Trochosa avara* Keys., *Arctosa littoralis* (Hentz), *Geolycosa wrightii* Em., *Lycosa avida* Walck., *L. frondicola* Em., L. sp.; *Xysticus pellar* Camb., *X. ferox* (Hentz), *X. funestus* Keys., *X. elegans* Keys., *X. sp.*; *Thanatus formicinus* (Clerck); *Marpissa pikei* (Peckh. and Peckh.), *Pellenes coronatus* (Hentz), *P. agilis* Bks., P. sp., *Phidippus audax* (Hentz), *P. clarus* Keys., *Habronattus viridipes* (Hentz); *Castianeira longipalpus* (Hentz), *C. sp.*

*Pompilinus splendens* Dreisbach, 1949. Ent. Amer. (n. s.) 29: 20. ♂.

*Pompilinus pseudoreductus* Dreisbach, 1949. Ent. Amer. (n. s.) 29: 21. ♂.

*Pompilinus ohioensis* Dreisbach, 1949. Ent. Amer. (n. s.) 29: 24. ♂.

*Pompilinus shappirioi* Dreisbach, 1952. Amer. Midland Nat. 48: 148, figs. 5, 6. ♂. N. syn. (H. E. Evans).

Biology: Evans, 1951. Amer. Ent. Soc., Trans. 76: 320 (prey). —Krombein, 1959. Ent. Soc. Wash., Proc. 61: 194 (prey). —Wasbauer and Powell, 1962. Kans. Ent. Soc., Jour. 35: 398 (prey). —Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 21-22 (prey).

—Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 374-375 (prey).

—Kurczewski and Kurczewski, 1973. Kans. Ent. Soc., Jour. 46: 70 (prey).

**stenotus bequaerti** (Dreisbach). Tex. and Fla. to Alta., Minn., Mich., and N. C. Ecology: Nests in sand. Prey: *Lycosa* sp.

*Pompilinus bequaerti* Dreisbach, 1949. Ent. Amer. (n. s.) 29: 16. ♂.

Biology: Krombein, 1964. Amer. Mus. Novitates 2201: 13 (prey transport).

**stenotus stenotus** (Banks). South. Fla. and Ala. Ecology: Nests in sand. Prey: *Lycosa* sp., *Trochosa* sp.

*Pompiloides stenotus* Banks, 1914. N. Y. Ent. Soc., Jour. 22: 302. ♂.

Biology: Krombein and Evans, 1955. Ent. Soc. Wash., Proc. 57: 230 (prey, nest).

—Kurczewski and Kurczewski, 1973. Kans. Ent. Soc., Jour. 46: 70 (prey).

**subcylindricus** (Banks). L. Austr. to Transit. Zones, Fla., Tex., and Ariz. to Utah, Minn., Que., and Vt.; Mexico to Morelos and Guerrero. Ecology: Nests in sand and gravelly soil.

Parasite: *Evagetes parvus* (Cr.). Prey: *Xysticus gulosus* Keys., *X. banksi* Bry., *X. ferox* (Hentz), *X. triguttatus* Keys., *X. funestus* Keys.; *Micaria* sp.

*Pompiloides subcylindricus* Banks, 1917. Mus. Compar. Zool., Bul. 61: 103. ♀, ♂.

Taxonomy: Evans, 1959. Ent. Soc. Amer., Ann. 52: 440 (larva).

Biology: Evans, 1951. Amer. Ent. Soc., Trans. 76: 288 (prey). —Evans, 1951. Amer. Ent. Soc., Trans. 77: 315 (prey). —Krombein, 1953. Wasmann Jour. Biol. 10: 281 (prey). —Evans and Yoshimoto, 1962. Ent. Soc. Amer., Misc. Pub. 3: 77-78 (prey transport, nest, life history, parasite). —Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 18-19 (prey).

**tenebrosus** (Cresson). Transcont. in Canad. and Transit. Zones, entering U. Austr. Ecology: Nests in sand. Prey: *Schizocosa saltatrix* Hentz, *Trochosa avara* Keys., *Tarentula kochi* Keys., *Lycosa frondicola* Em., *L. avida* Walck., *L. baltimoriana* Keys.; *Xysticus gulosus* Keys., *X. ferox* Hentz, *Thanatus formicinus* (Oliv.).

*Pompilus tenebrosus* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 453. ♀.

*Pompilus compactus* Provancher, 1895. Nat. Canad. 22: 111. ♀.

*Pompiloides canadensis* Banks, 1919. Canad. Ent. 51: 82. ♂.

*Pompilinus drakei* Dreisbach, 1958. Ent. News 69: 62, 2 figs. ♂. N. syn. (H. E. Evans). The unique holotype is a teratological specimen.

- Biology: Evans, 1951. Amer. Ent. Soc., Trans. 76: 303 (prey). — Evans and Yoshimoto, 1962. Ent. Soc. Amer., Misc. Pub. 3: 81 (prey). — Evans, 1970. Mus. Compar. Zool., Bul. 140: 482 (prey). — Wasbauer and Powell, 1962. Kans. Ent. Soc., Jour. 35: 399 (prey). — Kurczewski and Kurczewski, 1973. Kans. Ent. Soc., Jour. 46: 70-72 (prey transport, nest).
- texanus** (Dreisbach). La. and Tex. s. in Mexico to Morelos and Yucatan.  
*Pompilius texanus* Dreisbach, 1949. Ent. Amer. (n. s.) 29: 14. ♂.
- townesi** Evans. Alleghan. Fauna, N. H. w. to Man., Conn. to Fla.  
*Anoplius (Pompilius) townesi* Evans, 1951. Amer. Ent. Soc., Trans. 76: 313, fig. 102. ♂.

### Genus ANOPLIUS Subgenus ANOPLIUS Dufour

- Anoplius* Dufour, 1834. Soc. Ent. France, Ann. 2: 483.  
 Type-species: *Sphex nigerrimus* Scopoli. Desig. by Internatl. Conn. Zool. Nomencl., Op. 997, 1973.
- Pompilioides* Radoszkowski, 1887. Soc. Ent. Rossica, Horae 21: 94.  
 Type-species: *Pompilioides unicolor* Radoszkowski. Desig. by Ashmead, 1902.
- Aphiloctenus* Ashmead, 1902. Canad. Ent. 34: 87.  
 Type-species: *Pompilus virginianensis* Cresson. Orig. desig.
- Wasps of this subgenus nest in ready-made cavities of various kinds, and occupy a variety of habitats.
- depressipes** Banks. Carol. and Alleghanian Faunas, Tex., Ala. and Fla. to Wis. and Maine.  
 Ecology: Nests in pre-existing cavities in wood and soil; occasionally stores more than one cell per cavity, each cell separated by a partition of the substrate. Prey: *Dolomedes triton serpunctatus* Hentz, *D. scriptus* Hentz, *D. striatus* Giebel, *D. tenebrosus* Hentz.  
*Anoplius depressipes* Banks, 1919. Canad. Ent. 51: 81. ♀.
- Biology: Evans, 1949. Ent. Soc. Wash., Proc. 51: 206 (prey transport). — Evans and Yoshimoto, 1962. Ent. Soc. Amer., Misc. Pub. 3: 83-84 (prey transport, nest). — Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 22 (prey).
- dreisbachi** Evans. Ariz. and south. Calif. to Colo., Wyo. and B. C., chiefly in Transit. Zone.  
*Anoplius (Anoplius) dreisbachi* Evans, 1966. Amer. Ent. Soc., Mem. 20: 353, fig. 49. ♂, ♀.
- elongatus** Dreisbach. Mich., Minn.  
*Anoplius elongatus* Dreisbach, 1950. Amer. Midland Nat. 43: 576, figs. 11, 12. ♂.
- fulgidus** (Cresson). Extreme southern U. S., Fla., Tex., Ariz., Utah, Calif.; Antilles, Mexico, Central and South America to Peru and Brazil. Ecology: Nests in heavy loam along stream. Prey: *Pirata sedentarius* Montg., *Arctosa* sp. near *littoralis* (Hentz).  
*Pompilus fulgidus* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 131. ♀.  
*Pompilus aeneopurpureus* Fox, 1891. Amer. Ent. Soc., Trans. 18: 339. ♀, ♂.  
*Pompilus championi* Cameron, 1893. Biol. Cent.-Amer. Hym., v. 2, p. 196. ♀.  
*Pompilus mundulus* Fox, 1897. Acad. Nat. Sci. Phila., Proc. 49: 243. ♀.  
*Anoplius amarus* Banks, 1947. Mus. Compar. Zool., Bul. 99: 416. ♀.
- Biology: Wasbauer, 1955. Pan-Pacific Ent. 31: 63-66 (prey transport). — Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 22 (prey).
- hispidulus** Dreisbach. Ill., Mich., N. Y., Conn., Md.  
*Anoplius hispidulus* Dreisbach, 1950. Amer. Midland Nat. 43: 577, figs. 25, 26. ♂.
- illinoensis** (Robertson). U. Austr. and Transit. Zones, Ga., Tex., Utah, and Colo. to Mont., Mich., and Que. Ecology: Nests in firm soil. Prey: *Lycosa avida* Walck., *L. helluo* Walck., *L. sp.*  
*Pompilus illinoensis* Robertson, 1901. Amer. Ent. Soc., Trans. 27: 202. ♀, ♂.
- Taxonomy: Evans, 1959. Ent. Soc. Amer., Ann. 52: 439, figs. 20-25, 47 (larva).
- Biology: Evans and Yoshimoto, 1962. Ent. Soc. Amer., Misc. Pub. 3: 82-83 (prey transport, nest). — Kurczewski and Kurczewski, 1973. Kans. Ent. Soc., Jour. 46: 72 (prey).
- imbellis** Banks. Transcont. in U. Austr. and Transit. Zones south at higher altitudes to Costa Rica. Ecology: Nests in soil near still water. Prey: *Pardosa ramulosa* McCook, *P. milvina* (Hentz), *P. distincta* group, *P. sp.*, *Trochosa avara* Keys., *Arctosa* sp.  
*Anoplius imbellis* Banks, 1944. Mus. Compar. Zool., Bul. 94: 169. ♀, ♂.

*Anoplius imbellis* var. *major* Dreisbach, 1950. Amer. Midland Nat. 43: 581, figs. 20, 24. ♂.  
*Anoplius subimbellis* Dreisbach, 1952. Amer. Midland Nat. 48: 155, figs. 23, 25. ♂.

Biology: Wasbauer, 1957. Wasmann Jour. Biol. 15: 81-97, 7 figs. (prey, nests). — Wasbauer and Powell, 1962. Kans. Ent. Soc., Jour. 35: 399 (prey). — Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 22 (prey). — Kurczewski and Kurczewski, 1973. Kans. Ent. Soc., Jour. 46: 72 (prey).

*ithaca* (Banks). Transcont. in Transit. and U. Austr. Zones; Mexico (Nuevo Leon). Ecology: Occurs along rocky stream-beds and nests under stones. Prey: *Pardosa lapidicina* Em., *P. milvina* (Hentz), *P. groenlandica* Th., *P. steva* Lowrie and Gertsch, *P. sp.*, *Arctosa littoralis* (Hentz), *Lycosa* sp.  
*Psammochares ithaca* Banks, 1912 (1911). N. Y. Ent. Soc., Jour. 19: 224. ♀.  
*Anoplius selkirkensis* Banks, 1919. Mus. Compar. Zool., Bul. 63: 234. ♀, ♂.

Taxonomy: Evans, 1959. Ent. Soc. Amer., Ann. 52: 440 (larva).

Biology: Evans, 1948. Ent. News 59: 180-183 (prey transport, nest). — Evans and Yoshimoto, 1955. Kans. Ent. Soc., Jour. 28: 19 (prey). — Krombein, 1956. Brooklyn Ent. Soc., Bul. 51: 42 (prey transport). — Evans and Yoshimoto, 1962. Ent. Soc. Amer., Misc. Pub. 3: 83 (prey transport, nest). — Kurczewski, 1963 (1962). Brooklyn Ent. Soc., Bul. 57: 89 (prey hunting and transport). — Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 22 (prey). — Ricards, 1969. Ent. News 80: 149-157, 2 figs. (prey transport, nesting behavior). — Kurczewski and Kurczewski, 1973. Kans. Ent. Soc., Jour. 46: 72 (prey).

*nigerrimus* (Scopoli). Transcont. in Hudsonian and Canadian Zones, entering Transition Zone rarely; Holarctic. Ecology: Not known for North America; in Europe it nests in pre-existing cavities in twigs or soil, or under stones. Prey: Not known for North America; in Europe it preys chiefly on Lycosidae, occasionally on Pisauridae and Gnaphosidae.

*Spheg nigerrima* Scopoli, 1763. Ent. Carniolica, p. 295. ♀ ?  
*Pompilus incisus* Tischbein, 1850. Stettin. Ent. Ztg. 11: 8. ♂.  
*Pompilus excerptus* Tournier, 1889. Ent. Genevois 1: 159. ♀.  
*Pompilus nigerrimus* var. *Kohli* Verhoeff, 1892. Ent. Nachr. 18: 71. ♂.  
*Anoplius wheeleri* Banks, 1939. Canad. Ent. 71: 228. ♀, ♂.  
*Anoplius banksi* Dreisbach, 1950. Amer. Midland Nat. 43: 579, figs. 13, 14. ♂.

Taxonomy: van der Vecht and Menke, 1968. Bul. Zool. Nomencl. 25: 120-124 (request for designation of *nigerrimus* as type-species of *Anoplius*, and of a neotype for *nigerrimus*; request approved in Op. 997, Internatl. Comm. Zool. Nomencl., 1973).

Biology: Richards and Hamm, 1939. Soc. Brit. Ent., Trans. 6: 98-100 (summarizes European literature on prey, nests).

*papago* Banks. D. C. to Kans., s. to Fla. and Ariz. and Costa Rica. Ecology: Nests in loamy soil. Prey: *Lycosa* sp.

*Anoplius papago* Banks, 1941. Canad. Ent. 73: 120. ♂.  
*Anoplius subtarsatus* Dreisbach, 1950. Amer. Midland Nat. 43: 578, figs. 18, 22. ♂.  
*Anoplius guatemalensis* Dreisbach, 1952. Amer. Midland Nat. 48: 154. ♂.

Biology: Evans, 1964. Kans. Ent. Soc., Jour. 37: 304 (prey, nest).

*tenuicornis* (Tournier). Transcont. in Canad. Zone, s. to N. B., Vt., Man. and in mts. to N. Mex. and Calif.; Holarctic.

*Pompilus tenuicornis* Tournier, 1889. Ent. Genevois 1: 159. ♀.  
*Pompilus piliventris* Morawitz, 1889 Soc. Ent. Rossica, Horae. 23: 122. ♂.  
*Anoplius basalis* Dreisbach, 1950. Amer. Midland Nat. 43: 578, figs. 9, 10. ♂.

*toluca* (Cameron). Calif. to west. Tex., s. to Costa Rica; adventive in Hawaii. Ecology: Nests in soil. Prey: *Alopecosa gertschii* Schenkel, *Lycosa* sp., *Schizocosa* sp. in *avida* group, *Tarentula kochii* Keys., *Trochosa gosiuta* Chamb., *T. pratensis* (Em.); adults.

*Pompilus toluca* Cameron, 1893. Biol. Cent.-Amer., Hym. 2: 195. ♀.  
*Anoplius tarsatus* Banks, 1919. Mus. Compar. Zool., Bul. 63: 233. ♀.

Biology: Evans, 1964. Kans. Ent. Soc., Jour. 37: 305 (prey).

- ventralis* (Banks). Austrorip. to Alleghanian Fauna, Tex. and Fla. to Man., Ont., and N. S. Ecology: Nests in sand and in hard-packed soil Prey: *Agelenopsis naevia* (Walck.); *Lycosa helluo* Walck., *Schizocosa saltatrix* (Hentz), *Trochosa frondicola* (Em.). *Psammochares ventralis* Banks, 1910. N. Y. Ent. Soc., Jour. 18: 120. ♂.
- Biology: Wasbauer and Powell, 1962. Kans. Ent. Soc., Jour. 35: 399 (prey). — Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 23 (prey). — Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 375-376 (prey transport, nest).
- virginiensis* (Cresson). N. S., Sask., and B. C., s. to Wash., Colo., Mo., and Ga. Ecology: Occurs in open woods; nests in pre-existing cavities in dead wood. Prey: *Agelenopsis pennsylvanica* (Koch), *A. utahana* (Chamb. and Ivie), *Wadotes calcaratus* (Keys.); *W. hybridus* (Em.), *Coras juvenilis* (Keys.); *Amaurobius bennetti* (Blackw.); *Pardosa lapidicina* Em.
- Pompilus virginiensis* Cresson, 1867. Amer. Ent. Soc., Trans. 1: 92. ♂.
- Taxonomy: Evans, 1959. Ent. Soc. Amer., Ann. 52: 440 (larva).
- Biology: Evans and Yoshimoto, 1962. Ent. Soc. Amer., Misc. Pub. 3: 81-82 (prey hunting and transport, nest, life history). — Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 22 (prey transport). — Kurczewski and Kurczewski, 1973. Kans. Ent. Soc., Jour. 46: 72 (prey).

### Genus POMPILUS Fabricius

The species of this genus prey upon errant spiders, principally of the families Lycosidae, Salticidae, and Pisauridae; they nest in sand or soft earth so far as is known.

#### Genus POMPILUS Subgenus POMPILUS Fabricius

*Pompilus* Fabricius, 1798. Sup. Ent. System., p. 212.

Type-species: *Pompilus pulcher* Fabricius. Desig. by Internatl. Comn. Zool. Nomencl., Op. 166, 1945.

Members of the typical subgenus occur only in the Old World.

#### Genus POMPILUS Subgenus HESPEROPOMPILUS Evans

*Pompilus* subg. *Hesperopompilus* Evans, 1948. Ent. Soc. Wash., Proc. 50: 141.

Type-species: *Pompilus orophilus* Evans. Orig. desig.

The seven known species of this subgenus occur in western North America south into Baja California and Sonora.

Revision: Evans, 1966. Amer. Ent. Soc., Mem. 20: 358-370.

*hilli* Evans. Calif. (Pomona Mts.).

*Pompilus (Hesperopompilus) hilli* Evans, 1957. Pan-Pacific Ent. 33: 183. ♂.

*idahoensis* Evans. Idaho (Gooding).

*Pompilus (Hesperopompilus) idahoensis* Evans, 1966. Amer. Ent. Soc., Mem. 20: 367. ♀.

*jacintoensis* Evans. South. Calif. and Ariz.; Mexico (Baja California, Sonora).

*Pompilus (Hesperopompilus) jacintoensis* Evans, 1948. Ent. Soc. Wash., Proc. 50: 146. ♀ (♂ misdet.).

*Pompilus (Hesperopompilus) evagetoides* Evans, 1951. Amer. Ent. Soc., Trans. 77: 217. ♂.

*orophilus* Evans. Transit. Fauna, Alta. and Nebr. to N. Mex. and Calif.; Mexico (Sonora).

*Pompilus orophilus* Evans, 1947. Ent. News 58: 14. ♀.

*rufopictus* Evans. South. Calif. and Ariz. in deserts.

*Pompilus (Hesperopompilus) rufopictus* Evans, 1948. Ent. Soc. Wash., Proc. 50: 144. ♀.

*Pompilus (Hesperopompilus) boharti* Evans. 1951. Amer. Ent. Soc., Trans. 77: 216, figs. 176, 204. ♂.

*serrano* Evans. South. Calif.; Mexico (Baja California).

*Pompilus (Hesperopompilus) serrano* Evans, 1966. Amer. Ent. Soc., Mem. 20: 369, figs. 58, 83. ♀, ♂.

Genus **POMPILUS** Subgenus **XENOPOMPILUS** Evans

*Pompilus* subg. *Xenopompilus* Evans, 1953. Ent. Soc. Amer., Ann. 46: 531.

Type-species: *Pompilus (Xenopompilus) tlahuicanus* Evans. Orig. desig.

**tlahuicanus** Evans. Ariz. (Portal): Mexico (Puebla, Morelos, Jalisco, Durango, Chihuahua).

*Pompilus (Xenopompilus) tlahuicanus* Evans, 1953. Ent. Soc. Amer., Ann. 46: 534, fig. 1. ♀, ♂.

*Pompilus (Xenopompilus) tarahumarae* Evans, 1953. Ent. Soc. Amer., Ann. 46: 535. ♀.

Genus **POMPILUS** Subgenus **PERISSOPOMPILUS** Evans

*Pompilus* subg. *Perissopompilus* Evans, 1951. Amer. Ent. Soc., Trans. 77: 222.

Type-species: *Pompilus (Ammosphex) phoenix* Evans. Orig. desig.

**perfasciatus** Evans. South. Calif. and Ariz. in deserts; Mexico (Zacatecas).

*Pompilus (Perissopompilus) perfasciatus* Evans, 1951. Amer. Ent. Soc., Trans. 77: 225. ♀.

Taxonomy: Evans, 1958. Ent. News 69: 147, figs. 1-2. ♂.

**phoenix** Evans. Calif., Nev., Utah, west. Tex.; Mexico (Baja California and Sonora s. to Puebla and Guerrero). Ecology: Occurs in open, semiarid areas. Prey: *Filistata* sp.

*Pompilus (Ammosphex) phoenix* Evans, 1948. Pan-Pacific Ent. 24: 123. ♂, ♀.

Biology: Evans, 1966. Ent. Soc. Wash., Proc. 68: 339 (prey).

Genus **POMPILUS** Subgenus **XEROCHARES** Evans

*Pompilus* subg. *Xerochares* Evans, 1951. Amer. Ent. Soc., Trans. 77: 218.

Type-species: *Pompilus connexus* Fox. Orig. desig.

**expulsus** Schulz. South. Ariz.; Mexico to Nicaragua.

*Pompilus connexus* Fox, 1893. Calif. Acad. Sci., Proc. (2) 4: 23. ♀. Preocc.

*Pompilus expulsus* Schulz, 1906. Spolia Hym., p. 170. N. name.

*Psammochares arizonica* Banks, 1910. N. Y. Ent. Soc., Jour. 18: 115. ♀.

*Pompilus rubriventris* Bradley, 1944. Notulae Nat. 145, p. 9. N. name.

Genus **POMPILUS** Subgenus **AMMOSPHEX** Wilcke

*Ammosphex* Wilcke, 1942. Ent. Ber. 11: 25.

Type-species: *Pompilus unguicularis* Thomson. Orig. desig.

*Anopompilinus* Dreisbach, 1949. Ent. Amer. (n. s.) 29: 7, 10, 11.

Type-species: *Anopompilinus michiganensis* Dreisbach. Monotypic.

*Pompilus* subg. *Holarctopompilus* Wolf, 1965. Schweiz. Ent. Gesell., Mitt. 38: 101. N. syn. (H. E. Evans).

Type-species: *Psammochares gibbomimus* Haupt. Orig. desig.

*Pompilus* subg. *Boreopompilus* Wolf, 1965. Schweiz. Ent. Gesell., Mitt. 38: 101. N. syn. (H. E. Evans).

Type-species: *Pompilus trivialis* Dahlbom. Orig. desig.

**angularis angularis** (Banks). Transcont. in Transit. and U. Austr. Zones; Mexico (Baja California). Ecology: Occurs in sandy areas, and also nests in hard-packed soil. Prey:

*Callilepis altitudinis* Chamb., *C. imbecilla* (Keys.); *Xysticus* spp.; *Pellenes* spp., *Habronattus* ? sp., Thomisidae sp. Another subsp. occurs in Mexico.

*Psammochares angularis* Banks, 1910. N. Y. Ent. Soc., Jour. 18: 115. ♂.

Biology: Evans, 1959. Kans. Ent. Soc., Jour. 32: 76 (prey transport). —Wasbauer and Powell, 1962. Kans. Ent. Soc., Jour. 35: 399-400 (prey). —Evans, 1963. Ent. News 74: 239 (prey transport). —Evans, 1970. Mus. Compar. Zool., Bul. 140: 482 (prey transport).

—Kurczewski and Kurczewski, 1973. Kans. Ent. Soc., Jour. 46: 72-73 (prey transport).

—Alcock, 1973. Wasmann Jour. Biol. 31: 323-324, fig. 1 (nest, prey).

**anomalus anomalus** (Dreisbach). U. Sonor. and Transit. Faunas, Alta. to Ariz., Calif.; Mexico (Baja California). Prey: *Xysticus concolor* Thor. Another subsp. occurs in Mexico.

*Anopompilinus anomalus* Dreisbach, 1950. Amer. Midland Nat. 42: 725, 737. ♂.

*Anopompilinus arnaudi* Dreisbach, 1952. Amer. Midland Nat. 48: 153, figs. 1, 2. ♂.

Biology: Wasbauer and Powell, 1962. Kans. Ent. Soc., Jour. 35: 400 (prey).

- dakota dakota** (Dreisbach). *Transit. Zone*, Alaska, Mont. and N. Dak. s. to Ariz. and N. Mex.  
 Prey: *Thanatus formicinus* (Oliv.). Another subsp. occurs in Europe.  
*Anopompilinus dakota* Dreisbach, 1950. *Amer. Midland Nat.* 42: 728, figs. 9, 10. ♂.
- Biology: Evans, 1951. *Amer. Ent. Soc., Trans.* 77: 246 (prey).
- imbecillus imbecillus** (Banks). *Transcont. in Transit. Zone* except Pacific States. Ecology:  
 Occurs in open woods.  
*Anopliella imbecilla* Banks, 1939. *Canad. Ent.* 71: 227. ♀.  
*Anopompilinus coloradensis* Dreisbach, 1950. *Amer. Midland Nat.* 42: 724, 737. ♂.  
*Anopompilinus banksi* Dreisbach, 1950. *Amer. Midland Nat.* 42: 728, 737. ♂.
- imbecillus ojbibwae** Evans. *Canad. and Hudson. Zones*, N. B. and B. C., n. to N. W. T.  
*Pompilus (Ammosphex) imbecillus ojbibwae* Evans, 1951. *Amer. Ent. Soc., Trans.* 77: 249.  
 ♀, ♂.
- luctuosus luctuosus** Cresson. *Transcont. in Canad. Zone*, entering *Transit. Zone* in West.  
 Ecology: Occurs in open woods. Other subspp. occur in Palaearctic Region.  
*Pompilus luctuosus* Cresson, 1865. *Ent. Soc. Phila., Proc.* 4: 452. ♀.  
*Anopompilinus hirsutus* Dreisbach, 1950. *Amer. Midland Nat.* 42: 733, 737. ♂.  
*Anopompilinus mainensis* Dreisbach, 1950. *Amer. Midland Nat.* 42: 733, 737. ♂.
- michiganensis michiganensis** (Dreisbach). *Hudson., Canad., and Transit. Zones* from N. B., N. W. T., Yukon, s. to Alta., Minn., N. Y., and in mts. to Colo. and Ga. Ecology: Occurs in open woods and fields; nests in sand and sandy loam. Prey: *Xysticus concolor* Thor., *X. transversatus* (Walck.), *X. ferox* (Hentz), *X. funestus* (Keys.), *X. sp.* Another subsp. occurs in the Palaearctic Region.  
*Anopompilinus michiganensis* Dreisbach, 1949. *Ent. Amer. (n. s.)* 29: pl. 1, fig. 3. ♂.  
*Anopompilinus aspinosus* Dreisbach, 1950. *Amer. Midland Nat.* 42: 730, 738. ♂, ♀.
- Biology: Kurczewski and Snyder, 1964. *Biol. Soc. Wash., Proc.* 77: 215-222, 6 figs. (prey transport, nest). — Kurczewski and Kurczewski, 1968. *Kans. Ent. Soc., Jour.* 41: 23 (prey). — Kurczewski and Kurczewski, 1968. *Kans. Ent. Soc., Jour.* 41: 376 (prey, nest). — Kurczewski and Kurczewski, 1973. *Kans. Ent. Soc., Jour.* 46: 73 (prey).
- occidentalis** (Dreisbach). *Transit. Fauna*, B. C. and Alta. to Colo. and Calif., s. in Mexico to Morelos and Puebla. Ecology: Nests in gravel bank. Prey: *Pardosa uirtana* Gertsch, *P. sp.*  
*Anopompilinus occidentalis* Dreisbach, 1950. *Amer. Midland Nat.* 42: 726, 736, 738. ♂, ♀.
- Biology: Powell, 1957. *Pan-Pacific Ent.* 33: 39-40 (prey). — Evans, 1963. *Ent. News* 74: 239 (prey transport).
- parvulus** (Banks). *U. Sonor. and Transit. Faunas*, N. Mex. and Alta., w. to the Pacific, s. in Mexico to Baja California and Zacatecas.  
*Pompiloides parvulus* Banks, 1912 (1911). *N. Y. Ent. Soc., Jour.* 19: 227. ♀, ♂.  
*Pompilus (Ammosphex) parvulus tepahuanus* Evans, 1953. *Ent. Soc. Amer., Ann.* 46: 542. ♂.
- silvivagus** Evans. *Transit. Zone forests*, Tex., N. Mex., Colo., Ariz., Calif.  
*Pompilus (Ammosphex) solonus silvivagus* Evans, 1951. *Amer. Ent. Soc., Trans.* 77: 241, figs. 184, 218. ♂, ♀.
- solonus solonus** (Banks). *L. and U. Sonor. Faunas*, Calif., Colo., and cent. Tex.; Mexico (Baja California). Prey: *Lycosa sp.* Another subsp. occurs in Mexico.  
*Pompiloides solonus* Banks, 1914. *N. Y. Ent. Soc., Jour.* 22: 303. ♀.
- Biology: Evans, 1951. *Amer. Ent. Soc., Trans.* 77: 241 (prey).
- wasbaueri** Evans. *Calif. (Contra Costa and Tuolumne Co's.)*  
*Pompilus (Ammosphex) wasbaueri* Evans, 1966. *Amer. Ent. Soc., Mem.* 20: 396. ♂.

#### Genus POMPILUS Subgenus ARACHNOSPILA Kincaid

*Arachnospila* Kincaid, 1900. *Wash. Acad. Sci., Proc.* 2: 509.

Type-species: *Arachnospila septentrionalis* Kincaid. Monotypic.

*Pycnopompilus* Ashmead, 1902. *Canad. Ent.* 34: 83.

Type-species: *Pompilus scelestus* Cresson. Orig. design.



- arctus** Cresson. Transcont. in Canad. and Transit. Zones; Mexico (Hidalgo, Mexico). Ecology: Occurs in open woods; nests in gravelly soil. Prey: *Arctosa* sp., *Schizocosa saltatrix* (Hentz), *Trochosa avara* Keys.; *Amaurobius bennetti* (Blackw.), *A. ferox* Walck.; *Clubiona* sp.; *Orodassus coloradensis* Em.  
*Pompilus arctus* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 453. "♀" = ♂.  
*Psammochares anoplus* Banks, 1919. Mus. Compar. Zool., Bul. 63: 231, 232. ♀.  
*Pycnopompilus stouzensis* Dreisbach, 1950. Amer. Midland Nat. 43: 592, figs. 46, 47. ♂.  
*Pycnopompilus sculleni* Dreisbach, 1950. Amer. Midland Nat. 43: 594, figs. 33, 37. ♂.  
*Pycnopompilus parvus* Dreisbach, 1952. Amer. Midland Nat. 48: 152, figs. 3, 4. ♂.  
 Biology: Evans, 1951. Amer. Ent. Soc., Trans. 77: 260-261 (nest, prey). — Evans and Yoshimoto, 1962. Ent. Soc. Amer., Misc. Pub. 3: 86 (prey). — Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 376 (prey).  
**fumipennis eureka** (Banks). Canad. and Transit. Zones, B. C. and Mont. to Calif. and N. Mex.; Mexico (Baja California). Ecology: Nests off side of mammal burrow. Prey: *Tarentula kochi* Keys., *Trochosa pratensis* Em., *Lycosa* sp.  
*Psammochares eureka* Banks, 1919. Mus. Compar. Zool., Bul. 63: 231. ♀ (♂ misdet.).  
*Psammochares catalinae* Banks, 1933. Psyche 40: 7. ♀, ♂.  
 Biology: Evans, 1951. Amer. Ent. Soc., Trans. 77: 268 (prey, nest). — Evans, 1959. Kans. Ent. Soc., Jour. 32: 75 (prey). — Wasbauer and Powell, 1962. Kans. Ent. Soc., Jour. 35: 400 (prey).  
**fumipennis fumipennis** Zetterstedt. Transcont. in Canad. Zone, Alaska, N. W. T., and Labrador to Wash., Alta., N. Dak., and N. Y.; north. Europe.  
*Pompilus fumipennis* Zetterstedt, 1838. Ins. Lapponica, v. 1, p. 438. ♀.  
*Arachnospila septentrionalis* Kincaid, 1900. Wash. Acad. Sci., Proc. 2: 509. ♀.  
*Psammochares lasiope* Banks, 1919. Canad. Ent. 51: 81. ♀.  
**scelestus** Cresson. Transcont. in Transit. and U. Austral Zones, southern Canada to Calif. and Ga., s. in Mexico at higher altitudes to Guerrero and Oaxaca. Ecology: Occurs in open woods and on sand dunes; nests in light soil or sand. Parasite: *Evagetus parvus* (Cr.), *Ceropalus* sp. Prey: *Lycosa gulosa* Walck., *L. frondicola* Em., *L.* sp., *Trochosa avara* Keys., *Lycosidae* sp.; *Dolomedes* sp.; *Phidippus* sp.  
*Pompilus scelestus* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 451. ♀, ♂.  
*Pompilus pulchrinellus* Cameron, 1893. Biol. Cent.-Amer., Hym., v. 2, p. 194, pl. 11, figs. 12, 12a. ♀.  
*Pompilus Omiltemensis* Cameron, 1893. Biol. Cent.-Amer., Hym., v. 2, p. 197, pl. 11, figs. 18, 18a. ♂.  
*Psammochares astur* Banks, 1912 (1911). N. Y. Ent. Soc., Jour. 19: 225. ♀.  
*Psammochares sublaevis* Banks, 1921. Ent. Soc. Amer., Ann. 14: 20. ♀.  
*Pycnopompilus subscelestus* Dreisbach, 1950. Amer. Midland Nat. 43: 591, figs. 39, 40. ♂.  
 Biology: Peckham and Peckham, 1898. Wis. Geol. Nat. Hist. Survey, Bul. 2: 153-163 (prey, nest, parasite). — Peckham and Peckham, 1905. Wasps, social and solitary, pp. 230-242 (prey, nest, parasite). — Rau and Rau, 1918. Wasp Studies Afield, pp. 64-67 (prey, nest). — Evans, 1951. Amer. Ent. Soc., Trans. 77: 264 (prey, nest). — Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 23 (prey). — Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 377 (prey). — Evans, 1970. Mus. Compar. Zool., Bul. 140: 483 (prey transport, nest). — Kurczewski and Kurczewski, 1973. Kans. Ent. Soc., Jour. 46: 73-74, fig. 2 (prey, nest).

#### Genus POMPILUS Subgenus ANOPLOCHARES Banks

*Anoplochaes* Banks, 1939. Canad. Ent. 71: 225, 229.

Type-species: *Pompiloides rectus* Banks. Orig. desig.

The North American species are found in open woods. The lack of a tarsal pecten suggests that the females nest in pre-existing cavities, such as those of the prey as in the European *spissus* Schiodte.

**apicatus** Provancher. Newfoundland, Sask., and B. C. s. to Fla., Tex., and Calif.

*Pompilus apicatus* Provancher, 1882. Nat. Canad. 13: 35, 38.

*Pompiloides rectus* Banks, 1914. N. Y. Ent. Soc., Jour. 22: 303. ♀, ♂.

*Pompiloides elsinore* Banks, 1919. Mus. Compar. Zool., Bul. 63: 235, 236. ♀.

*similaris* (Banks). Alleghanian and Carol. Faunas, Ont. and New England s. to Fla. and w. to Ill.

*Anoplius similaris* Banks, 1919. Canad. Ent. 51: 82. ♀.

### Genus APORINELLUS Banks

*Aporinellus* Banks, 1912 (1911). Ent. Soc. Wash., Proc. 13: 238.

Type-species: *Aporus fasciatus* Smith. Desig. by Banks, 1912.

*Ferreoloides* Haupt, 1929. Zool. Mus. Berlin, Mitt. 15: 150.

Type-species: *Pompilus moestus* Klug. Desig. by Bradley, 1944.

*Eupompiloides* Gussakovsky, 1935. Konowia 14: 141.

Type-species: *Pompilus moestus* Klug. Monotypic.

*Ceratopompilus* Bradley, 1944. Eos 20: 95, 97.

Type-species: *Pompilus sexmaculatus* Spinola. Orig. desig.

Occur chiefly in sandy places, and visit honeydew and occasionally flowers; prey usually upon spiders of the family Salticidae.

Revision: Bequaert, 1919. Psyche 26: 115-123. —Evans, 1966. Amer. Ent. Soc., Mem. 20: 402-423.

Taxonomy: Evans, 1957. Pan-Pacific Ent. 33: 185-186 (revised key).

*basalis* Banks. Kans., Tex. and Oreg. s. to Costa Rica. Ecology: Nests in sand. Prey: *Oxyopes helius* Chamb.

*Aporinellus basalis* Banks, 1933. Psyche 40: 3. ♀.

*Aporinellus bridwelli* Evans, 1951. Amer. Ent. Soc., Trans. 77: 291, figs. 197, 265. ♂.

Biology: Evans, 1959. Kans. Ent. Soc., Jour. 32: 76 (prey transport).

*borregoensis* Evans. South. Calif., Ariz. and Nev.

*Aporinellus borregoensis* Evans, 1957. Pan-Pacific Ent. 33: 184, fig. 2. ♂, ♀.

*completus* Banks. Transcont. in south. Canada and U. S., s. in Mexico to Chiapas at higher altitudes. Ecology: Nests in soil. Prey: *Phidippus clarus* Keys, *Habronattus* sp., *Pellenes oregonensis* Peckh., *P. viridipes* (Hentz), *P. borealis* (Bks.), *P. sp.*, *Evarcha hoyi* (Peckh.), *Habrocestum pulex* (Hentz), *Maevia vittata* (Hentz), *Sitticus palustris* (Peckh.).

*Aporinellus completus* Banks, 1917. Mus. Compar. Zool., Bul. 61: 97. ♀.

Biology: Evans, 1951. Amer. Ent. Soc., Trans. 77: 294 (prey). —Evans, 1962. Kans. Ent. Soc., Trans. 32: 76 (prey). —Krombein, 1961. Brooklyn Ent. Soc., Bul. 56: 63 (prey, nest).

—Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 377 (prey). —Kurczewski and Kurczewski, 1973. Kans. Ent. Soc., Jour. 46: 74 (prey).

*fasciatus* (Smith). N. C., Ill., Alta. and B. C., s. to Fla., Tex. and Calif., s. in Mexico at higher altitudes to Puebla and Morelos.

*Aporus fasciatus* Smith, 1855. Cat. Hym. Brit. Mus., v. 3, p. 175. ♂. Preocc. in *Pompilus*.

*Pompilus unionis* Dalla Torre, 1897. Cat. Hym., v. 8, p. 330. N. name.

*Aporus apicatus* Banks, 1910. N. Y. Ent. Soc., Jour. 18: 126. ♂.

*medianus* Banks. Calif., Wyo., Mich. and N. Y. s. to Costa Rica. Ecology: Nests in sand. Prey: *Oxyopes salticus* Hentz, *Maevia vittata* Hentz, *Phidippus whitmanii* Peckh. ?, *P. sp.*, *Salticus* sp., *Tibellus duttoni* (Hentz), *Xysticus* sp. near *gulosus* Keys. This sp. was consistently misdet. as *fasciatus* Sm. until 1966.

*Aporinellus medianus* Banks, 1917. Mus. Compar. Zool., Bul. 61: 97. ♀.

*Aporinellus intermedius* Banks, 1919. Mus. Compar. Zool., Bul. 63: 240. ♀.

Biology: Peckham and Peckham, 1898. Wis. Geol. Nat. Hist. Survey, Bul. 2: 55-57 (prey, nest).

—Krombein, 1959. Ent. Soc. Wash., Proc. 61: 194-195 (prey, nest). —Kurczewski and Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 23-24 (prey hunting and transport, nest).

*taeniatus baboquivari* Evans. Ariz. (Baboquivari Mts.).

*Aporinellus taeniatus baboquivari* Evans, 1951. Amer. Ent. Soc., Trans. 77: 286. ♀.

**taeniatus rufus** Banks, Colo., Minn., Nebr.

*Aporinellus rufus* Banks, 1912 (1911). N. Y. Ent. Soc., Jour. 19: 230. ♀.

**taeniatus taeniatus** (Kohl). B. C., Minn. and Mass. s. to Calif., La. and Fla., and to Guatemala from sea level to at least 7500 ft. Ecology: Nests in sand. Prey: *Habronattus calcaratus* (Bks.), *Pellenes agilis* (Bks.), *P. borealis* (Bks.), *P. viridipes* (Hentz), *P. sp.*

*Pompilus taeniatus* Kohl, 1886. Zool.-Bot. Gesell. Wien, Verh. 36: 315. ♀.

*Pompilus taeniolatus* Dalla Torre, 1897. Cat. Hym., v. 8, p. 326. N. name.

*Aporus ferrugineipes* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 203. ♀.

*Aporinellus californicus* Rohwer, 1917. U. S. Natl. Mus., Proc. 53: 240. ♀.

*Aporinellus banksi* Bequaert, 1919. Psyche 26: 118. ♀.

*Aporinellus semirufus* Banks, 1929. Psyche 36: 326. ♀.

*Aporinellus bequaerti* Banks, 1933. Psyche 40: 3. ♀.

Biology: Evans, 1951. Amer. Ent. Soc., Trans. 77: 284 (prey). — Krombein, 1964. Amer. Mus. Novitates 2201: 13 (prey). — Kurczewski and Kurczewski, 1973. Kans. Ent. Soc., Jour. 46: 74 (prey, nest).

**taeniatus wheeleri** Bequaert. Alleghanian Fauna, Mass. to N. C.

*Aporinellus wheeleri* Bequaert, 1919. Psyche 26: 118. ♀.

**yucatanensis** (Cameron). N. J., Iowa, Mont. and Oreg. s. to Costa Rica except at high altitudes.

Ecology: Nests in sand. Prey: *Xysticus* sp.

*Pompilus (Aporus) yucatanensis* Cameron, 1893. Biol. Cent.-Amer., Hym., v. 2, p. 189. ♀.

*Aporinellus laticeps* Banks, 1912 (1911). N. Y. Ent. Soc., Jour. 19: 230. ♀.

*Aporinellus sinuatus* Evans, 1951. Amer. Ent. Soc., Trans. 77: 298, figs. 199, 246, 250, 253, 256. ♂, ♀.

Biology: Krombein, 1959. Ent. Soc. Wash., Proc. 61: 194 (prey, nest; misdet. as *apicatus*).

#### Genus ALLOCHARES Banks

*Allochaes* Banks, 1917. Mus. Compar. Zool., Bul. 61: 98.

Type-species: *Allochaes bruesi* Banks. Monotypic.

Revision: Bradley, 1944. Amer. Ent. Soc., Trans. 70: 148.

**azureus** (Cresson). Fla. to south. Calif., s. in Mexico to Puebla and Veracruz.

*Pompilus (Agenia) azureus* Cresson, 1867. Amer. Ent. Soc., Trans. 1: 131. ♀.

*Pompilus sinaloae* Cameron, 1893. Biol. Cent.-Amer., Hym., v. 2, p. 192. ♀.

*Allochaes bruesi* Banks, 1917. Mus. Compar. Zool., Bul. 61: 98. ♀.

#### Genus PARACYPHONONYX Gribodo

*Paracyphononyx* Gribodo, 1884. Mus. Civ. Stor. Nat. Genova, Ann. (2) 1: 306.

Type-species: *Paracyphononyx melanicus* Gribodo. Monotypic.

*Schistosalius* Saussure, 1892. In Grandidier, Hist. Nat. Madagascar, v. 20, Hym., v. 1, p. 313.

Type-species: *Salius ellioti* Saussure. Desig. by Ashmead, 1902.

*Paracyphononyx* Ashmead, 1902. Canad. Ent. 34: 81.

Type-species: *Paracyphononyx metemmensis* Magretti. Orig. desig.

*Allocephonyx* Ashmead, 1902. Canad. Ent. 34: 136.

Type-species: *Pompilus maurus* Cresson. Orig. desig.

*Pompiloides* Sustera, 1913. Zool.-bot. Gesell. Wien, Verhandl. 62: 180.

Type-species: *Pompilus ruficrus* Klug. Monotypic.

*Dicyrtomus* Haupt, 1927. Deut. Ent. Ztschr., Beih., pp. 150, 256.

Type-species: *Pompilus ruficrus* Klug. Orig. desig.

*Atopopompilus* Arnold, 1937. Transvaal Mus., Ann. 19: 22.

Type-species: *Pompilus venans* Kohl. Orig. desig.

*Anacyphononyx* Haupt, 1950. Explor. Parc. Nat. Albert, Miss. de Witte, fasc. 69, p. 59.

Type-species: *Pompilus semiplumbeus* Taschenberg. Orig. desig.

**funereus** (Lepeletier). Mass., Mich., S. Dak. and Utah s. to Fla., Tex. and Ariz., s. in Mexico to Yucatan. Prey: *Lycosa lenta* (Hentz).

*Anoplus funereus* Lepeletier, 1845. Hist. Nat. Ins., Hym., v. 3, p. 449. ♂.

*Pompilus maurus* Cresson, 1867 Amer. Ent. Soc., Trans. 1: 88. ♀, ♂.

*Psammochares (Allocyphonyx) harpalycce* Banks, 1910. Psyche 17: 250. ♂.

Biology: Hurd and Wasbauer, 1956. Kans. Ent. Soc., Jour. 29: 169 (prey).

#### SUBFAMILY CEROPALINAE

This group is considered a family by some workers.

Revision: Townes, 1957. U. S. Natl. Mus., Bul. 209: 221-272, 32 figs.

#### TRIBE MINAGENIINI

##### Genus MINAGENIA Banks

*Pseudagenia* subg. *Minagenia* Banks, 1934. Amer. Acad. Arts and Sci., Proc. 69: 40, 64.

Type-species: *Pseudagenia (Minagenia) brevicornis* Banks. Orig. desig.

*Nannochilus* Banks, 1934. Mus. Compar. Zool., Bul. 94: 171.

Type-species: *Pseudagenia externa* Banks. Orig. desig.

*Compsagenia* Haupt, 1959. Nova Acta Leopoldina 21, no. 141: 29.

Type-species: *Compsagenia laevipes* Haupt. Orig. desig.

Biological notes have been reported on *osoria* (Bks.) only. The larva lives as an external parasite of an active lycosid spider. The wasp cocoon is spun under bark.

**clypeata** (Banks). Md. to N. C., Mich.

*Ageniella clypeata* Banks, 1914. N. Y. Ent. Soc., Jour. 22: 306. ♂.

*Minagenia shappirioi* Dreisbach, 1953. Amer. Midland Nat. 49: 839, figs. 1, 5. ♂.

**congrua** (Cresson). Alleghan. Fauna, Qu. to Va., W. Va., Mich. *M. michiganensis* Dreisb. is possibly a syn.

*Pompilus (Agenia) congruus* Cresson, 1867. Amer. Ent. Soc., Trans. 1: 129. ♀.

*Agenia rufigastrea* Provancher, 1889. Addit. Corr. Faune Ent. Canada, Hym., p. 264. ♀.

*Minagenia semirufa* Dreisbach, 1953. Amer. Midland Nat. 49: 841, figs. 10, 14. ♂.

**externa** (Banks). Tex. (Lee Co.).

*Pseudagenia externa* Banks, 1910. N. Y. Ent. Soc., Jour. 18: 124. ♀.

**julia** (Brimley). Atlantic and Gulf Coast States, Md. to Tex.

*Ageniella julia* Brimley, 1934. Ent. News 45: 42. ♂.

**lata** Townes. S. C. (McClellanville, Columbia).

*Minagenia lata* Townes, 1957. U. S. Natl. Mus., Bul. 209: 230, pl. 3, fig. 36, pl. 4, fig. 44. ♂.

**lutea** Dreisbach. Okla. (Vinita).

*Minagenia lutea* Dreisbach, 1955. Ent. News 66: 106. ♀.

**major** Townes. D. C., Ga.

*Minagenia major* Townes, 1957. U. S. Natl. Mus., Bul. 209: 229. ♂, ♀.

**michiganensis** Dreisbach. Mich. (Roscommon Co.). Possibly a syn. of *congrua* (Cr.).

*Minagenia michiganensis* Dreisbach, 1953. Amer. Midland Nat. 49: 842, figs. 9, 12. ♂.

**montisdorsa** Dreisbach. Ohio, Ga., La., Tex.; Mexico (Baja California, Zacatecas).

*Minagenia montisdorsa* Dreisbach, 1953. Amer. Midland Nat. 49: 840, figs. 3, 7. ♂.

**osoria** (Banks). Md., Va., W. Va., Ga., Tex. Host: Lycosidae spp.

*Nannochilus osoria* Banks, 1944. Mus. Compar. Zool., Bul. 94: 172. ♂, ♀.

Biology: Kaston, 1959. Brooklyn Ent. Soc., Bul. 54: 103-106, fig. 9 (host, life history).

#### TRIBE NOTOCYPHINI

##### Genus NOTOCYPHUS Smith

*Notocyphus* Smith, 1855. Cat. Hym. Brit. Mus., v. 3, p. 172.

Type-species: *Notocyphus saevissimus* Smith. Desig. by Smith, 1873.

**dorsalis arizonicus** Townes. L. Sonoran Fauna of Ariz. and Calif.

*Notocyphus dorsalis arizonicus* Townes, 1957. U. S. Natl. Mus., Bul. 209: 223. ♂, ♀.

*dorsalis dorsalis* Cresson. Tex.; Mexico (Chihuahua, Durango).

*Notocyphus dorsalis* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 207. ♀.

*Notocyphus texanus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 207. ♂.

#### TRIBE CEROPALINI

#### Genus CEROPALES Latreille

*Ceropales* Latreille, 1796. Precis Caract. Gen. Ins., p. 123.

Type-species: *Evania maculata* Fabricius. Desig. by Curtis, 1839.

*Ceratopales* (!) Howard, 1901. Insect Book. pl. 5, fig. 10.

*Ceratopales* Schulz, 1906. Spolia Hym., p. 174. Emend.

*Agentoxenus* Ashmead, 1902. Canad. Ent. 34: 137.

Type-species: *Ceropales rufiventris* Walsh. Orig. desig. (= *Ceropales robinsonii* Cresson).

*Hypsiceræus* Morice and Durrant, 1915. Ent. Soc. London, Trans. pp. 403, 405.

Type-species: *Evania maculata* Fabricius. Orig. desig.

Members of this genus are social parasites of other spider wasps. The female *Ceropales* lays her egg in the brood cell of the spider prey of the host either during transport of the prey or while the prey is lying unguarded. The *Ceropales* larva hatches first, devours the host egg, and then feeds on the host prey.

Revision: Fox, 1892. Amer. Ent. Soc., Trans. 19: 49-63.

Taxonomy: Dreisbach, 1948 (1946). Mich. Acad. Sci., Arts, and Letters, Papers 32: 249 (key to Mich. spp.). — Dreisbach, 1948. N. Y. Ent. Soc., Jour. 56: 233-268 (key to U. S. spp.).

*bipunctata bipunctata* Say. Atlantic to 100° W. in Transit. and U. Austr. Zones.

*Ceropales bipunctata* Say, 1824. In Keating, Narr. Long's 2nd Exped., v. 2, app., p. 334. ♂, ♀.

*bipunctata tibialis* Banks. N. C. to Fla.

*Ceropales bipunctata* var. *tibialis* Banks, 1910. N. Y. Ent. Soc., Jour. 18: 126. ♂, ♀.

*Ceropales floridensis* Dreisbach, 1948. N. Y. Ent. Soc., Jour. 56: 233. ♀.

*brevicornis* Patton. La., Tex., N. Mex. n. to Pa. and Alta., Wash.

*Ceropales brevicornis* Patton, 1879. U. S. Geol. and Geog. Survey, Bul. 5: 368. ♂.

*cubensis albopicta* Cresson. South. Tex. to Panama, Baja California. Typical *cubensis* Cresson occurs in the West Indies.

*Ceropales albopicta* Cresson, 1869. Boston Soc. Nat. Hist., Proc. 12: 378. ♂.

*elegans aquilonia* Townes. Alta., Minn.

*Ceropales elegans aquilonia* Townes, 1957. U. S. Natl. Mus., Bul. 209: 256. ♂.

*elegans elegans* Cresson. Pacific to 100° W. in U. Austr. and L. Austr. Zones.

*Ceropales elegans* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 208. ♀.

*Ceropales Cressoni* Fox, 1892. Amer. Ent. Soc., Trans. 19: 58. ♂, ♀.

*elegans quaintancei* Viereck, Md. to Fla., Ill., Kans.

*Ceropales quaintancei* Viereck, 1902. Ent. News 13: 275. "♂" = ♀.

*femoralis* Cresson. Va. to Kans., s. to Panama.

*Ceropales femoralis* Cresson, 1869. Boston Soc. Nat. Hist., Proc. 12: 378. ♀.

*Ceropales foxii* Rohwer, 1916. Canad. Ent. 48: 369. ♂.

*fulvipes* Cresson. Tex.

*Ceropales fulvipes* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 208. ♀.

*hatoda* Brimley N. Y. to N. C., Minn. Host: *Ageniella partita* Bks.

*Ceropales hatoda* Brimley, 1928. Elisha Mitchell Sci. Soc., Jour. 43: 201. ♂.

Biology: Krombein, 1955. Brooklyn Ent. Soc., Bul. 50: 15 (host).

*longipes* Smith. N. J. to Ga., Mo.

*Ceropales fasciata* Say, 1824. In Keating, Narr. Long's 2nd Exped., v. 2, app., p. 333; Leconte Ed. v. 1, p. 224 Preocce.

*Ceropales longipes* Smith, 1855. Cat. Hym. Brit. Mus., v. 3, p. 179. ♀.

*Ceropales frigida* Smith, 1855. Cat. Hym. Brit. Mus., v. 3, p. 180. N. name.

- maculata caenosa* Townes. Calif. (Sierra Nevada Mts.).  
*Ceropales maculata caenosa* Townes, 1957. U. S. Natl. Mus., Bul. 209: 242. ♀, ♂.
- maculata fraterna* Smith. Transcont., chiefly in Canad. and Trans. Zones, but replaced in far West by *maculata stretchii* Fox and *maculata caenosa* Townes, and in the Alberta-Dakotas area by *maculata rhodomerus* Townes. Host: *Pompilus scelestus* Cr., *Prionemys* sp., prob. *germana* Cr. Typical *maculata* (Fabricius) is European.  
*Ceropales fraterna* Smith, 1855. Cat. Hym. Brit. Mus., v. 3, p. 180. ♀.  
*Ceropales minima* Provancher, 1887. Addit. Corr. Faune Ent. Canada, Hym., p. 265. ♂.  
*Ceropales fraternus occidentalis* Cockerell, 1898. Ann. and Mag. Nat. Hist. (7) 2: 455. ♂.
- Taxonomy: Rohwer, 1916. Canad. Ent. 48: 369 (notes on type of *minima*).  
 Biology: Peckham and Peckham, 1898. Wis. Nat. Hist. Survey, Bul. 2: 154-155, 239 (host).  
 —Evans and Yoshimoto, 1962. Ent. Soc. Amer., Misc. Pub. 3: 112 (host).
- maculata rhodomerus* Townes. South. Alta. and Mont. to N. and S. Dak., and occasional individuals from Minn., Mich., N. Y., Mass. in range of *maculata fraterna* Smith.  
*Ceropales maculata rhodomerus* Townes, 1957. U. S. Natl. Mus., Bul. 209: 243. ♀, ♂.
- maculata stretchii* Fox. Calif. east of Sierra Nevada Mts., n. to B. C. and e. to Idaho, north. Nev., and Utah.  
*Ceropales Stretchii* Fox, 1892. Amer. Ent. Soc., Trans. 19: 52. ♀.
- neomexicana* Rohwer. N. Mex., Calif.; Mexico (Zacatecas, Durango).  
*Ceropales neomexicana* Rohwer, 1915. U. S. Natl. Mus., Proc. 49: 236. ♂.
- nigripes* Cresson. Pacific to 100° W. in Transit. and U. Austr. Zones; Mexico (Durango, Zacatecas).  
*Ceropales nigripes* Cresson, 1867. Amer. Ent. Soc., Trans. 1: 139. ♀.  
*Ceropales texana* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 208. ♂.
- pacifica* Townes. Oreg., Calif.  
*Ceropales pacifica* Townes, 1957. U. S. Natl. Mus., Bul. 209: 264. ♂, ♀.
- robinsonii robinsonii* Cresson. Que. to Fla., Ont., Ohio, Ill. Host: *Phanagenia bombycina* (Cr.).  
*Ceropales Robinsonii* Cresson, 1867. Amer. Ent. Soc., Trans. 1: 140. ♂.  
*Ceropales rufiventris* Walsh and Riley, 1869. Amer. Ent. 1: 136, 163. ♂, ♀.  
*Ceropales superba* Provancher, 1883. Nat. Canad. 14: 36. ♀.
- Biology: Walsh and Riley, 1869. Amer. Ent. 1: 136, 163 (host).
- robinsonii stigmatica* Banks. Kans., Tex.  
*Ceropales robinsonii* var. *stigmatica* Banks, 1910. N. Y. Ent. Soc., Jour. 18: 126. ♀.
- rugata* Townes. Oreg., Calif., Wyo., Utah, Gulf and South Atlantic States; Mexico (Zacatecas, Teotihuacan).  
*Ceropales rugata* Townes, 1957. U. S. Natl. Mus., Bul. 209: 264. ♂, ♀.

## UNPLACED TAXA OF POMPILIDAE

- Pompilus bipartitus* Lepeletier, 1845. Hist. Nat. Ins., Hym., v. 3, p. 439. ♀. Philadelphia.  
 Preocc.; replaced by *Pompilus semipartitus* Dalla Torre.  
*Pompilus semipartitus* Dalla Torre, 1897. Cat. Hym., v. 8, p. 321. N. name for *Pompilus bipartitus* Lepeletier.

## Family RHOPALOSOMATIDAE

During their larval stages the two North American rhopalosomatids are external parasites of nymphal crickets. Gurney (1953) undoubtedly had material of both species before him in his study of the biology and larval stages of what he supposed to be *Rhopalosoma* only. He recorded as hosts *Hapithis a. agitator* Uhler, *H. agitator quadratus* Scudd., *H. brevipennis* Sauss., *H. sp.*, and *Orocharis sp.*

Taxonomy: Gurney, 1953. U. S. Natl. Mus., Proc. 103: 25-31, figs. 8, 9 (larva).

Biology: Gurney, 1953. U. S. Natl. Mus., Proc. 103: 19-25, pl. 1.

## Genus RHOPALOSOMA Cresson

The adults are fully winged, have enlarged ocelli and are nocturnal.

*Rhopalosoma* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 58.

Type-species: *Rhopalosoma Poeyi* Cresson. Monotypic.

*Sibyllina* Westwood, 1868. Ent. Soc. London, Trans. p. 329.

Type-species: *Sibyllina aenigmatica* Westwood. Monotypic (= *Rhopalosoma poeyi* Cr.).

Revision: Brues, 1943. Ent. Soc. Amer., Ann. 36: 310-318, 1 pl.

**nearticum** Brues. Md. south to Fla., Ky., Mo. Host: *Orocharis saltator* Uhler.

*Rhopalosoma nearticum* Brues, 1943. Ent. Soc. Amer., Ann. 36: 316. ♀, ♂.

Biology: Hood, 1914 (1913). Ent. Soc. Wash., Proc. 15: 145-147, 1 fig. (Misdet. as *R. poeyi* Cresson.)

### Genus OLIXON Cameron

*Olixon* Cameron, 1887. Biol. Cent.-Amer. Hym., v. 1, p. 412.

Type-species: *Olixon testaceum* Cameron. Monotypic.

*Saphobethylus* Kieffer, 1911. Soc. Sci. Bruxelles, Ann. (2) 35: 216.

Type-species: *Saphobethylus pallidus* Kieffer. Monotypic.

*Nealga* Brues, 1922. Psyche 29: 105.

Type-species: *Nealga banksii* Brues. Monotypic.

This genus is unusual in that extreme brachyptery is equally developed in both sexes. The species are much smaller than *Rhopalosoma*, have tiny ocelli and are diurnal.

Taxonomy: Reid, 1939. Roy. Ent. Soc. London, Proc. 8: 101.

**banksii** (Brues). N. Y., D. C., N. C., Ga., Fla., Ohio, Minn., Kans. Host: *Nemobius* sp.; *Hapithis agitator* Uhler.

*Nealga banksii* Brues, 1922. Psyche 29: 106. ♀.

Biology: Krombein, 1950 (1949). Elisha Mitchell Sci. Soc., Jour. 65: 264-265 (male).





## Superfamily SPHECOIDEA

By KARL V. KROMBEIN

For nearly a century most specialists in this group, influenced by Kohl's ultra-conservative views, considered that the superfamily contained a single family, the Sphecidae. The monumental generic reclassification by Bohart and Menke (1976) embraces this opinion. However, Brothers (1975) demonstrates convincingly that each of the aculeate superfamilies should comprise several families if the family-level groups are to represent categories of equal phylogenetic value. The classification used elsewhere in this catalog supports the latter conviction. Accordingly the major subfamilies recognized by Bohart and Menke are restored to family rank, a position accorded them by most specialists of the previous century.

Some authors believe that the sphecoid wasps and the bees belong to a single superfamily, the Sphecoidea. For example, Brothers divides the Sphecoidea into two informal groups, the Spheciformes and Apiformes, with eight and nine families respectively. However, on the basis of the presence or absence of a hind tibial strigil, Boerner (1919) divides the Aculeata into two subsections, the sphecoids, pompiloids and vespoids, and the formicoids, scolioids and apoidea. The phylogeny of the sphecoid wasps and bees requires more intensive investigation than they have had hitherto, for the possibility exists that the bees may not be so closely related to the sphecoid wasps as supposed by some workers. At this time the Sphecoidea and Apoidea are maintained as separate superfamilies.

The behavior and life history of this diverse assemblage of wasps has attracted a host of observers both in the United States and abroad. Many species are ground nesters and are known popularly as digger wasps; most of them dig their own nests but some species appropriate pre-existing burrows of other arthropods and modify them as needed. Numerous species nest above ground in pre-existing cavities such as abandoned borings of beetle larvae in wood, old insect galls and old mud-dauber nests; many of these species can be induced to nest in borings in wood called trap-nests. Some of our species excavate their own nests in soft pith of shrubs such as sumac and elderberry, or in rotten wood. Relatively few North American species are mason wasps, building various kinds of mud cells. Several genera are cleptoparasites of other ground-nesting sphecoids. So far as known the North American species are all solitary wasps, but apparent eusociality has been discovered in the Neotropical genus *Microstigmus* Ducke.

Members of the Sphecoidea prey upon a great variety of terrestrial insect orders as well as upon spiders. Varying degrees of host specificity are found among the several families and lesser categories. In general the more primitive sphecoids prey upon the more primitive and ancient groups of Hemimetabola while the more advanced groups prey upon the higher groups of Holometabola.

The pre-1920 references listed below under the side-head Taxonomy are not reliable for generic or specific discrimination.

Revision: Bohart and Menke, 1976. Sphecoid wasps of world, 695 pp., 190 figs. (reclassification of world genera, lists of species-level taxa).

Taxonomy: Ashmead, 1899. *Canad. Ent.* 31: 145-155, 161-174, 212-225, 238-251, 291-300, 322-330, 345-357 (keys to families and genera, and lists of No. Amer. spp.). — Smith, 1908. *Nebr. Univ., Studies* 8: 323-410, 1 pl. (keys to *Nebr. spp.*). — Mickel, 1918 (1917). *Nebr. Univ., Studies* 17: 342-456, 2 figs. (keys to *Nebr. spp.*). — Pate, 1937. *Amer. Ent. Soc., Mem.* 9: 1-103 (generic names and type-species). — Evans and Lin, 1956. *Amer. Ent. Soc., Trans.* 81: 131-166, 13 pls. (larvae of Sphecinae). — Evans and Lin, 1956. *Amer. Ent. Soc., Trans.* 82: 35-66, 13 pls. (larvae of Nyssoninae). — Evans, 1957. *Amer. Ent. Soc., Trans.* 83: 79-117, 12 pls. (larvae of Philanthinae, Trypoxyloninae and Crabroninae). — Evans, 1959. *Amer. Ent. Soc., Trans.* 85: 137-191, 7 pls. (addendum to larvae, keys to subfamilies and genera based on larval characters, and remarks on evolution and classification based on larval characters). — Evans, 1964. *Amer. Ent. Soc., Trans.* 90: 235-299, 12 pls. (larvae, supplement). — Evans, 1964. *Ent. News* 75: 225-237, 3 figs. (classification and evolution of digger wasps based on larvae). — Brothers, 1975. *Kans. Univ. Sci. Bul.* 50: 586-587, 640-641 (phylogeny).

Biology: Evans, 1963. *Sci. Amer.* 208 (4): 145-154 (evolution as evidenced by predatory behavior). — Evans, 1966. *Science* 152: 465-471, 6 figs. (accessory burrows of digger wasps). — Kurczewski and Snyder, 1968. *Conservationist* 23 (2): 28-31, 11 figs. (evolution of cliff-nesting in digger wasps). — Miller and Kurczewski, 1973. In Dindal, *Proc. First Soil Microcommunities Conf.*, USAEC, CONF-711076; Natl. Tech. Inform. Serv., USDC, pp. 204-217 (ecology of digger wasps). — Evans, 1975 (1974). *N. Y. Ent. Soc., Jour.* 82: 259-267, 4 figs. (digger wasps as colonizers of new habitats). — Alcock, 1975. *Anim. Behaviour* 23: 893-894 (male behavior and territoriality).

## Family AMPULICIDAE

These primitive sphecoid wasps occur principally in the tropics of the Old and New Worlds. Appropriately, they prey upon cockroaches, one of the most primitive of insect orders. The biology of only a few species has been observed. The nests are constructed in pre-existing cavities or crevices, such as in twigs, beneath bark of trees or in the soil. Unlike other sphecoids, the prey is carried backwards on foot as in most pompilid wasps.

Taxonomy: Kohl, 1893. *K. K. Naturhist. Hofmus., Ann.* 8: 455-516, 3 pls. (generic diagnoses, key to and descriptions of *Ampulex* spp.). — Evans, 1959. *Ent. News* 70: 57-61, 6 figs. (larvae).

### SUBFAMILY DOLICHURINAE

#### Genus DOLICHURUS Latreille

*Dolichurus* Latreille, 1809. *Gen. Crust. Ins.*, v. 4, p. 387.

Type-species: *Pompilus corniculatus* Spinola. Monotypic.

*Thyreospheer* Ashmead, 1904. *Canad. Ent.* 36: 282.

Type-species: *Thyreospheer Stantoni* Ashmead. Monotypic.

Morphology: Snodgrass, 1941. *Smithsn. Inst., Misc. Collect.* 99 (14): pl. 21, figs. F, G (male genitalia).

*greenei* Rohwer. *Ont. to Fla., Mo. Ecology: Nests under leaf litter in woods. Prey: Parcoblatta* sp., nymph.

*Dolichurus greenei* Rohwer, 1916. *Ent. Soc. Wash., Proc.* 18: 212. ♀.

Taxonomy: Bradley, 1934. *Ent. News* 45: 33-34, ♂.

Biology: Krombein, 1955. *Brooklyn Ent. Soc., Bul.* 50: 15 (prey, nest site).

#### Genus PARADOLICHURUS Williams

*Dolichurus* subg. *Paradolichurus* Williams, 1960. *Wasmann Jour. Biol.* 17: 299.

Type-species: *Dolichurus (Paradolichurus) californicus* Williams. Orig. desig. *californicus* (Williams). Calif. (San Diego Co.).

*Dolichurus (Paradolichurus) californicus* Williams, 1960. *Wasmann Jour. Biol.* 17: 300, figs. 1, 2, 4. ♀.

## SUBFAMILY AMPULICINAE

## Genus AMPULEX Jurine

*Ampulex* Jurine, 1807. Nouv. Meth. Class. Hym. Dipt., p. 132.

Type-species: *Sphex compressus* Fabricius. Desig. by Audouin, 1822.

*Pronoeus* Latreille, 1809. Gen. Crust. Ins., v. 4, p. 56.

Type-species: *Dryinus aeneus* Fabricius. Monotypic.

*Lorrehum* Leach, 1837. In Shuckard, Essay on Indig. Fossor. Hym., p. 18. A manuscript name of Leach, validated by Shuckard.

Type-species: *Sphex compressus* Fabricius. Desig. by Shuckard, 1837.

*Rhinopsis* Westwood, 1844. Arcana Ent., v. 2, p. 68.

Type-species: *Rhinopsis Abbottii* Westwood. Monotypic.

*Waagenia* Kriechbaumer, 1874. Stettin Ent. Ztg. 35: 55.

Type-species: *Waagenia sikkimensis* Kriechbaumer. Monotypic.

*Chlorampulex* Saussure, 1892. In Grandidier, Hist. Nat. Madagascar, v. 20, p. 441.

Type-species: *Sphex compressus* Fabricius. Desig. by Pate, 1937.

*canaliculata* Say. Mass. to Ga., Ohio, Wis., Mo., Kans. Ecology: Nests in cavities in twigs and in borings in wood. Prey: *Parcoblatta virginica* (Brunner), P. sp., *Ischnoptera* sp.

*Ampulex canaliculatus* Say, 1823. West. Quart. Rptr. 2: 76.

*Rhinopsis Abbottii* Westwood, 1844. Arcana Ent., v. 2, p. 68, pl. 65, fig. 5. ♀.

*Ampulex pennsylvanica* Haldeman, 1849. Acad. Nat. Sci. Phila., Proc. 4: 203.

*Rhinopsis melanognathus* Rohwer, 1912. U. S. Natl. Mus., Proc. 41: 464. "♀" = ♂.

Taxonomy: Schulz, 1911. Zool. Ann. 4: 149-152. —Bradley, 1934. Ent. News 45: 32-33.

—Evans, 1959. Ent. News 70: 57-58, 6 figs. (larva).

Biology: Williams, 1929. Hawaii. Ent. Soc., Proc. 7: 318-329, 10 figs. (nest, prey, life history).

—Krombein, 1967. Trap-nesting wasps and bees, pp. 173-175, figs. 49-51 (nest, prey, life history).

Morphology: Snodgrass, 1941. Smithsn. Inst., Misc. Collect. 99 (14): 50, pl. 22, figs. A-D (male genitalia).

*ferruginea* Bradley. Fla., Tex.

*Ampulex (Rhinopsis) ferruginea* Bradley, 1934. Ent. News 45: 274. ♂.

Taxonomy: Strandmann, 1943. Ent. Soc. Amer., Ann. 36: 46-48. ♀.

## Family SPHECIDAE

Collectively, the members of this family are known as thread-waisted wasps because of the slender, elongate abdominal petiole. Most North American species are moderately large wasps, many of them with conspicuous coloration. The nesting habits are quite varied: The majority of species are digger or sand wasps, excavating their nests in soil; others utilize pre-existing cavities or borings in wood, or abandoned mud-dauber cells; a few are mud-daubers. The prey is also quite varied and includes spiders, cockroaches, crickets, grasshoppers, katydids and larvae of Lepidoptera and Hymenoptera. Normally, the species of a genus or higher category prey upon species of only one of the foregoing groups.

Taxonomy: Evans and Lin, 1956. Amer. Ent. Soc., Trans. 81: 131-153, 73 figs. (larvae).

—Evans, 1959. Amer. Ent. Soc., Trans. 85: 147-149, figs. 31-35 (larvae). —Bohart and

Menke, 1963. Univ. Calif. Pubs. Ent. 30: 91-182, 115 figs. (reclassification). —Evans, 1964.

Amer. Ent. Soc., Trans. 90: 237-245, pls. 8-9 (larvae). —Menke, 1965. Tijdschr. v. Ent. 108: 205-217, 8 figs. (syn. of some New World spp.).

## SUBFAMILY SCELIPHRONINAE

Revision: Bohart and Menke, 1963. Univ. Calif. Pubs. Ent. 30: 99-117 (Nearectic spp.).

## Genus CHLORION Latreille

*Chlorion* Latreille, 1802. Hist. Nat. Crust. Ins., v. 3, p. 333.

Type-species: *Sphex lobata* Fabricius. Monotypic.

*Chlorium* Schulz, 1906. *Spolia* Hym., p. 193. Emend.

Revision: Menke, 1961. Ent. Soc. Amer., Ann. 54: 667-669, 9 figs. (N. Amer. spp.).

**aerarium** Patton. Entire U. S. Ecology: Nests in sand, probably constructing several cells per nest. Prey: *Gryllus rubens* Scud., *G. pennsylvanicus* (Burm.), *G. sp.*, *Anurogryllus muticus* (De Geer).

*Chlorion aerarium* Patton, 1879. Canad. Ent. 11: 133. ♀.

*Sphex* (*Chlorion*) *nearcticus* Kohl, 1890. K. K. Naturhist. Hofmus., Ann. 5: 186. ♀, ♂.

Taxonomy: Evans, 1964. Amer. Ent. Soc., Trans. 90: 242-244, figs. 9-12 (larva).

Biology: Peckham and Peckham, 1900. Wis. Nat. Hist. Soc., Bul. 1: 85-87 (nest, prey, parasite). — Peckham and Peckham, 1905. Wasps, Social and Solitary, pp. 256-261 (nest, prey, parasite). — Krombein, 1953 (1952). Wasmann Jour. Biol. 10: 283 (prey). — Krombein, 1958. Ent. Soc. Wash., Proc. 60: 104 (nest). — Krombein, 1959. Ent. Soc. Wash., Proc. 61: 195 (prey).

**cyaneum** Dahlbom. Tex., N. Mex., Ariz.; Mexico.

*Chlorion cyaneum* Dahlbom, 1843. Hym. Europaea, v. 1, p. 24.

*Sphex* (*Chlorion*) *occultus* Kohl, 1890. K. K. Naturhist. Hofmus., Ann. 5: 187. ♀, ♂.

### Genus PODIUM Fabricius

*Podium* Fabricius, 1804. Systema Piezatorum, pp. x, 183.

Type-species: *Podium rufipes* Fabricius. Desig. by Latreille, 1810.

*Talithybius* Rafinesque, 1815. Analyse Nature ou Tabl. Univers, Palermo, p. 124. N. name.

*Ammophilus* Perty, 1833. Delect. Anim. Artic. Brasil, p. 141.

Type-species: *Ammophilus fumigatus* Perty. Desig. by Pate, 1937.

*Parapodium* Taschenberg, 1869. Ztschr. Gesam. Naturw. Halle 34: 423.

Type-species: *Parapodium biguttatum* Taschenberg. Monotypic.

Most of the species are Neotropical. Biological information has been published on only a few species, all of which prey upon cockroaches and nest in pre-existing cavities in wood, termite mounds or mud-dauber nests.

Revision: Kohl, 1902. Zool.-Bot. Gesell. Wien, Abh. 1 (4): 1-101.

**krombeini** Bohart and Menke. Tex., southern Calif.; Mexico (Morelos, Puebla, Oaxaca).

*Podium krombeini* Bohart and Menke, 1963. Univ. Calif. Pubs. Ent. 30: 106, figs. 4, 49, 60. ♂, ♀.

**luctuosum** Smith. N. Y. to Tex., Mo., Kans. Ecology: Nests in borings in wood or in dead tree trunks; closing plug of rotten wood particles at inner end, the outer end plastered with mud. Parasite: *Melittobia chalybii* Ashm.; *Neochrysis panamensis* (Cam.)? Prey:

*Parcoblatta uhleriana* (Sauss.), adults.

*Podium luctuosum* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 235. ♀.

Taxonomy: Evans, 1964. Amer. Ent. Soc., Trans. 90: 244-245, figs. 14, 15 (larva).

Biology: Krombein, 1964. Brooklyn Ent. Soc., Bul. 58: 118-119 (nest). — Krombein, 1967.

Trap-nesting wasps and bees, pp. 255-257, figs. 64, 65 (nest, prey, life history, parasites).

**rufipes** Fabricius. N. Y. to Fla., Iowa, Kans., Tex.; Mexico, Central and South America.

Ecology: Nests in borings in wood and in abandoned mud-dauber nests; closing plug of a variety of compacted debris or earth with an outer coating of resin. Parasite:

*Histiostoma myrmicarum* Scheuch.; *Lepidophora appendiculata* (Macq.); *Megaselia* sp.;

*Melittobia chalybii* Ashm.; *Neochrysis panamensis* (Cam.). Prey: *Parcoblatta*

*pennsylvanica* (DeG.), *P. sp.*, *Chorisonera texensis* Sauss. and Zehnt., *Cariblatta lutea*

(Sauss. and Zehnt.), *C. minima* Heb., *Latiblatella rehni* Heb., *Eurycotis floridana*

(Wlkr.), adults and nymphs. Predator: *Cymatodera undulata* Say.

*Podium rufipes* Fabricius, 1805. Systema Piezatorum, p. 183.

*Parapodium biguttatum* Taschenberg, 1869. Ztschr. Gesam. Naturw. Halle 34: 423. ♂, ♀.

*Podium carolina* Rohwer, 1911. U. S. Natl. Mus., Proc. 40: 556. ♀.

Taxonomy: Evans and Lin, 1956. Amer. Ent. Soc., Trans. 81: 150, figs. 69-73 (larva).

Biology: Rau, 1937. Ent. News 48: 91-93 (nest, prey, life history). — Krombein, 1958. Amer. Ent. Soc., Trans. 84: 147-149 (nest, prey, life history, parasite). — Krombein, 1967. Trap-nesting wasps and bees, pp. 251-255, figs. 62, 63 (nest, prey, life history, parasites, predator). — Krombein, 1970. Smithsn. Contrib. Zool. 46: 12-22, figs. 40-61 (nest behavior, prey, life history).

### Genus CHALYBION Dahlbom

*Chalybion* Dahlbom, 1843. Hym. Europaea, v. 1, p. 21.

Type-species: *Sphex cyanea* Fabricius. Desig. by Patton, 1880.

*Chalybium* Agassiz, 1847. Nomencl. Zool., p. 77. Emend.

*Chalybium* Schulz, 1906. Spolia Hym., p. 192. Emend.

Only the typical subgenus occurs in North America. These wasps nest in pre-existing cavities, most commonly in abandoned nests of mud-daubers, but also in holes in wood, bamboo and plant stems, and crevices in walls. There is one atypical record of *californicum* opening a sealed nest of *Sceliphron caementarium* (Dru.), the black and yellow mud-dauber, extracting the enclosed spiders, and restocking the nest with its own spiders.

Revision: Kohl, 1918. K. K. Naturhist. Hofmus. Ann. 32: 1-171 (World spp.). — Hutson, 1919. Amer. Ent. Soc., Trans. 45: 203-227 (N. Amer. spp.).

*californicum* (Saussure). Transcontinental in U. S., B. C., northern Mexico; adventive in Hawaii and Bermuda. Ecology: Nests in abandoned mud nests of *Sceliphron caementarium* (Dru.). Parasite: *Anthrax limatulus artemisia* Marst., *Sphaerophthalma* (S.) *a. auripilis* (Bl.). Prey: *Latrodectus mactans* (F.) most commonly, *Asagena americana* Em., *Enoplognatha puritana* Chamb. and Ivie, *Theridion tepidariorum* (Koch), *T. frondeum* Hentz, *T. australe* Bks., *Steatoda borealis* (Hentz); *Neoscona* sp., *Epeira foliata* (Fourcr.), *Araneus* sp., *Gea heptagon* (Hentz); Misumeninae sp., Thomisidae spp.; *Oxyopes scalaris* Hentz, Oxyopidae sp.; *Paraphidippus marginatus* (Walck.), Salticidae sp.

*Sphex caerulea* Linnaeus, 1763. Centuria Ins. Rar., p. 30. Preocc.

*Sphex cyanea* Fabricius, 1775. Systema Ent., No. 5, p. 346. Preocc.

*Pelopoëus* (*Chalybion*) *californicus* Saussure, 1867. Reise d. Novara, Zool., v. 2, Hym., p. 26.

Taxonomy: Rau, 1915. Psyche 22: 62-63 (cocoon). — Evans and Lin, 1956. Amer. Ent. Soc., Trans. 81: 149, figs. 67, 68 (larva).

Biology: Peckham and Peckham, 1898. Wis. Geol. Nat. Hist. Survey, Bul. 2 (Sci. Ser. 1): 176-199 (nest, prey). — Peckham and Peckham, 1905. Wasps Social and Solitary, pp. 265-274 (nest, prey). — Rau, 1915. Ent. News 26: 469-471 (number of generations per year). — Rau, 1928. Ent. Soc. Amer., Ann. 21: 25-35 (nesting habits). — Rau, 1928. Acad. Sci. St. Louis, Trans. 25: 443-448 (nesting habits). — Rau, 1935. Ent. News 46: 259-260 (prey). — Irving and Hinman, 1935. Science 82: 395-396 (prey). — Muma and Jeffers, 1945. Ent. Soc. Amer., Ann. 38: 245-255 (prey). — Ward, 1972. Ind. Acad. Sci., Proc. 81: 177-181 (sleeping aggregations).

Morphology: Snodgrass, 1941. Smithsn. Inst., Misc. Collect. 99, no. 14: 50, pl. 23, figs. H, J, L (male genitalia).

*zimmermanni aztecum* (Saussure). Western Tex. to Ariz., Utah; Mexico to Costa Rica, Clarion Is. Ecology: Nests in old mud nests of *Sceliphron assimile* (Dahlb.). Parasite: *Anthrax pluricellus* Will.

*Pelopoëus* (!) *aztecus* Saussure, 1867. Reise der Ost. Freg. Novara, Zool. 2: 26. ♂.

*Sceliphron* (*Chalybion*) *monstrosus* Kohl, 1918. K. K. Naturhist. Hofmus., Ann. 32: 61. ♂.

Biology: Rau, 1940. Ent. Soc. Amer., Ann. 33: 591 (nests, parasite). — Rau, 1942. Canad. Ent. 74: 196 (sleeping aggregation).

*zimmermanni zimmermanni* Dahlbom. Tenn., N. C., Fla. to eastern Tex., Ind.; Hispaniola.

Ecology: Nests in borings in wood and in old mud nests of *Sceliphron caementarium* (Dru.). Parasite: *Melittobia chalybii* Ashm. Prey: *Araneus* spp., *Argiope aurantia* Luc.,

*A. trifasciata* (Forsk.), *Cyclosa conica* (Pall.); *Theridion frondeum* Hentz, *Asagena americana* Em.

*Chalybion zimmermanni* Dahlbom, 1843. Hym. Europaea, v. 1, p. 22. ♀, ♂.

*Pelopoëus texanus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 210. ♀, ♂.

Biology: Ward, 1970. Ind. Acad. Sci., Proc. 79: 231-233 (nest, prey). — Ward, 1971. Ind. Acad. Sci., Proc. 80: 264-266, 1 fig. (nests). — Ward, 1973. Ind. Acad. Sci., Proc. 82: 231-233 (growth in captivity). — Ward, 1973. Ind. Acad. Sci., Proc. 82: 233-234 (parasite).

### Genus SCELIPHRON Klug

#### Genus SCELIPHRON Subgenus SCELIPHRON Klug

*Sceliphron* Klug, 1801. Neue Schr. Gesell. Naturf. Freunde Berlin 3: 561.

Type-species: *Sphex spirifer* Linnaeus. Desig. by Bingham, 1897.

*Pelopoëus* Latreille, 1803 (1802). Hist. Nat. Crust. Ins., v. 3, p. 334.

Type-species: *Sphex spirifer* Linnaeus. Desig. by Latreille, 1810.

*Pelopoëus* Latreille, 1804. Nouv. Dict. Hist. Nat., v. 24, p. 180. Emend. or error.

*Sceliphron* Schulz, 1906. Spolia Hym., p. 192. Emend.

Only the typical subgenus occurs in North America. Most species are tropical.

These are the common black and yellow mud-daubers which build mud cells in sheltered situations. Each cell is stored with a number of small, paralyzed spiders.

Revision: Kohl, 1918. K. K. Naturhist. Hofmus., Ann. 32: 1-171 (world spp.). — Porter, 1926.

U. S. Natl. Mus., Proc. 70 (1): 1-22 (N. Amer. spp.). — van der Vecht and van Breugel, 1968.

Tijdschr. Ent. 111: 185-255 (world spp.).

assimile (Dahlbom). Tex.; Mexico south to Panama, Cuba. Parasite: *Acroicnus cubensis* (Cr.).

Prey: *Epeira oaxacensis* Keys., *E. fuscovittata* Keys.; *Misumena* sp.; *Scytodes* sp.;

*Phidippus* sp.

*Pelopoëus assimilis* Dahlbom, 1843. Hym. Europaea, v. 1, p. 23. ♀, ♂.

*Sceliphron caementarium* var. *nicaraguanum* Kohl, 1918. K. K. Naturhist. Hofmus., Ann. 32: 118. ♀.

Biology: Dow, 1932. Psyche 39: 10-12 (nest, prey, parasite).

**caementarium** (Drury). South. Canada and entire U. S. south to Central America, West Indies; adventive in Bermuda, Peru, Japan, Mariana Is., Marshall Is., Hawaii, Australia, New Caledonia, Fiji, Samoa, Society Is., Marquesas Is., Gambier Is., France, Germany, Madeira Is. Parasite: *Anthrax limatulus fur* (O. S.), *A. l. artemisia* Marst.; *Amobia floridensis* (Tns.); *Acroicnus s. stylator* (Thunb.), *A. s. edwardsii* (Cr.), *A. s. junceus* (Cr.); *Chrysus fuscipennis* Br.; *Sphaerophthalma* (Photopsioides) sp., *S. (S.) a. auripilis* (Bl.), *S. (S.) p. pennsylvanica* (Lep.), *S. (S.) p. scaeva* (Bl.). Prey: *Neoscona arabesca* (Walck.), *N. benjamina* (Walck.), *N. sp.*, *Acanthepeira stellata* (Walck.), *Argiope trifasciata* (Forsk.), *A. aurantia* Luc., *Epeira foliata* (Fourcr.), *E. displicata* Hentz, *E. sp.*, *Aranea nivea* Hentz, *A. miniata* (Walck.), *A. cornuta* Cl., *A. sp.*, *Metepeira labyrinthica* (Hentz), *Eustala anastera* (Walck.), *Mangora gibberosa* (Hentz.); *Philodromus perrini* Blackw., *Misumenops asperatus* (Hentz), *Misumena calycina* (L.), *M. sp.*, *Misumenoides aleatorius* (Hentz), *Misumeninae* sp., *Thomisidae* sp.; *Phidippus mystaceus* Hentz, *P. clarus* Keys., *P. sp.*, *Xysticus ferox* (Hentz), *Marpissa undata* (DeG.), *Salticidae* sp.; *Schizocosa crassipes* (Walck.), *Lycosidae* sp.; *Dolomedes* sp.; *Anyphaenidae* sp.; *Oxyopes scalaris* Hentz, *O. salticus* Hentz, *Oxyopidae* sp.; *Clubionidae* sp. Predator: *Lecontella cancellata* (LeC.).

*Sphex caementaria* Drury, 1773. Illus. Nat. Hist., v. 2, index.

*Sphex flavomaculata* DeGeer, 1773. Mem. Hist. Ins., v. 3, p. 588.

*Sphex lunata* Fabricius, 1775. Systema Ent. p. 347.

*Sphex flavipes* Fabricius, 1781. Species Ins., p. 444.

*Sphex flavipunctata* Christ, 1791. Naturgesch. Class. Nomencl., p. 301.

*Sphex affinis* Fabricius, 1793. Ent. System., v. 2, p. 203.

*Pelopoëus architectus* Lepeletier, 1845. Hist. Nat. Ins., Hym., v. 3, p. 313. ♀.

*Pelopoëus servillei* Lepeletier, 1845. Hist. Nat. Ins., Hym., v. 3, p. 313. ♀.

*Pelopoëus solieri* Lepeletier, 1845. Hist. Nat. Ins., Hym., v. 3, p. 318. ♀.

*Pelopoëus canadensis* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 233. ♂.

*Pelopoëus nigriventris* Costa, 1864. Mus. Zool. Napoli, Ann. 2: 60.

*Pelopoëus tahitensis* Saussure, 1867. Reise d. Novara, Zool., v. 2, Hym., p. 27, pl. 2, fig. 17. ♀, ♂.

*Sphex economica* Curtiss, 1938. Short Zoology of Tahiti, p. 155.

Taxonomy: Rau, 1915. Psyche 22: 62-63 (cocoon). — Evans and Lin, 1956. Amer. Ent. Soc., Trans. 81: 147, figs. 50-56 (larva).

Biology: Peckham and Peckham, 1898. Wis. Geol. and Nat. Hist. Survey, Bul. 2 (Sci. Ser. 1): 176-199 (nest, prey). — Peckham and Peckham, 1905. Wasps, Social and Solitary, pp. 265-274 (nest, prey). — Rau and Rau, 1913. Ent. News 24: 392-401 (nest, prey). — Rau, 1915. Jour. Anim. Behavior 5: 240-249 (experiments on prey recognition). — Rau, 1915. Ent. News 26: 469-471 (number of generations per year). — Rau and Rau, 1918. Wasp Studies Afield, pp. 118-124 (nest). — Rau, 1928. Acad. Sci. St. Louis, Trans. 25: 443-466 (nest, prey, experiments with substitute prey). — Rau, 1935. Ent. News 46: 267-270 (prey). — Muma and Jeffers, 1945. Ent. Soc. Amer., Ann. 38: 246-255 (prey). — Rau, 1946. Brooklyn Ent. Soc., Bul. 41: 10-11 (parasites, mating). — Shafer, 1949. Ways of a mud dauber, 78 pp., 10 pls., 9 figs. (nest, life history, physiology). — Eberhard, 1971 (1970). Psyche 77: 247-251 (predatory behavior).

Morphology: Snodgrass, 1941. Smithsn. Inst., Misc. Collect. 99: no. 14: 50, pl. 23, figs. A-F (male genitalia).

#### SUBFAMILY SPHECINAE

All of our species are ground-nesting except for those belonging to *Isodontia* which nest in pre-existing cavities in wood, stems or in the ground.

Revision: Kohl, 1890. K. K. Naturhist. Hofmus., Ann. 5: 77-194, 317-462 (world spp.).

— Fernald, 1906. U. S. Natl. Mus., Proc. 31: 291-423 (New World spp.). — Bohart and Menke, 1963. Univ. Calif. Pubs., Ent. 30: 117-160 (Nearctic spp.).

#### TRIBE SPHECINI

#### Genus SPHEX Linnaeus

#### Genus SPHEX Subgenus SPHEX Linnaeus

*Sphex* Linnaeus, 1758. Syst. Nat., ed. 10, v. 1, p. 569.

Type-species: *Sphex flavipennis* Fabricius. Desig. by Internatl. Com. Zool. Nomencl., Op. 180, 1946.

*Sphaex* Scopoli, 1772. Observ. Zool., Hist.-Nat., v. 5, p. 122. Emend. or error.

*Ammobia* Billberg, 1820. Enum. Ins., p. 105.

Type-species: *Pepsis argentata* Fabricius. Desig. by Rohwer, 1911.

*Proterosphex* Fernald, 1905. Ent. News 16: 165.

Type-species: *Sphex maxillosus* Fabricius. Orig. desig.

Members of this subgenus are all fossorial, and many of them nest gregariously in the same site year after year. So far as known the Nearctic species construct multicelled nests, each cell at the end of a lateral from the vertical or oblique burrow. Preferred prey are nymphs or adults of Tettigoniidae, but occasionally Gryllacrididae are also stored. Our species practice mass provisioning, but one Oriental species practices progressive provisioning and is also unusual in constructing 1-celled nests.

*ashmeadi* (Fernald). Calif., Nev., Utah, Colo., Ariz., N. Mex., Tex.; Mexico (Tamaulipas, Nuevo Leon).

*Chlorion* (*Proterosphex*) *ashmeadi* Fernald, 1906. U. S. Natl. Mus., Proc. 31: 389. ♀, ♂.

*dorsalis* Lepeletier. Southern U. S., Fla. and Ga. to Calif.; Central and South America.

Ecology: Nests in firm soil, the burrow vertical or nearly so, terminating in one or more cells, each cell stored with 1-3 prey specimens. Prey: *Conocephalus fasciatus* (DeG.), C. sp.

*Sphex dorsalis* Lepeletier, 1845. Hist. Nat. Ins., Hym., v. 3, p. 347. ♂.

*Sphex singularis* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 261. ♂.

*Sphex chlorargyrica* Costa, 1862. Mus. Zool. Napoli, Ann. 1: 66.

*Sphex micans* Taschenberg, 1869. Ztschr. Gesam. Naturw. Halle 34: 419. ♀. Preocc.

*Sphex dubitata* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 213. ♀.

*Sphex spiniger* Kohl, 1890. K. K. Naturhist. Hofmus., Ann. 5: 428. ♂.

Biology: Dow, 1932. Psyche 39: 8-9 (nest, prey). —Krombein and Evans, 1954. Ent. Soc. Wash., Proc. 56: 233-234 (nest, prey, life cycle).

**flavovestitus flavovestitus** Smith. Va. to Fla., west to Tex.; Mexico (Durango). Parasite:

*Pseudoxenos smithii* (Heyd.). Another subspecies occurs in Mexico.

*Sphex flavovestita* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 253. ♂.

*Sphex flavipes* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 263. ♀. Preocc.

*Chlorion (Proterosphe) flavitarsis* Fernald, 1906. U. S. Natl. Mus., Proc. 31: 379. ♀, ♂. N. name.

**habenus** Say. Md. to Fla., west to Ark. and Tex.; Mexico (Sinaloa). Parasite: *Pseudoxenos smithii* (Heyd.). Prey: Tettigoniidae sp., nymph.

*Sphex habena* Say, 1832. New Sp. N. Amer. Ins. chiefly of Louisiana, p. 14. ♀.

*Sphex laeta* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 212. ♀.

*Sphex laeta* var. *illustris* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 210. ♀.

*Sphex princeps* Kohl, 1890. K. K. Naturhist. Hofmus., Ann. 5: 398. ♀.

*Sphex chrysophorus* Kohl, 1890. K. K. Naturhist. Hofmus., Ann. 5: 300. ♀.

*Sphex lanciger* Kohl, 1895. K. K. Naturhist. Hofmus., Ann. 10: 55. ♂.

Biology: Strandmann, 1953. Kans. Ent. Soc., Jour. 26: 51-52 (nest, prey).

**ichneumoneus** (Linnaeus). Southern Canada, U. S., south to Brazil and Peru. Ecology: Nests in hard-packed soil or sand, the burrow vertical or nearly so, each nest with 2-7 cells, each cell provisioned with several prey specimens. Parasite: *Pseudoxenos smithii* (Heyd.); *Metopia argyrocephala* (Meig.), *M. campestris* (Fall.), *Senotainia trilineata* (Wulp); *Nysson plagiatus* Cr. Prey: *Neoconocephalus ensiger* (Harr.), *N. sp.*, *Acanthodius* (SP) (*Atlanticus dorsalis* (Burm.), *Conocephalus attenuatus* (Scud.), *C. fasciatus* (DeG.), *C. brevipennis* (Scud.), *C. triops* (L.), *C. sp.*, *Neduba* sp., *Scudderella texensis* (Sauss.), *S. pistillata* (Brunn.), *Orchelimum vulgare* Harr., *O. calcaratum* R. and H., *O. delicatum* Brun., *Amblycorypha oblongifolia* (DeG.); *Oecanthus n. nigricornis* (Wlkr.); *Brachybaenus* sp., *Gryllacris* sp. This handsome wasp is commonly called "The Great Golden Digger".

*Apis ichneumonea* Linnaeus, 1758. Syst. Nat., ed. 10, p. 578.

*Nomada surinamensis* Retzius, 1783. Genera et Species Insectorum, p. 62. N. name.

*Sphex auriflua* Perty, 1834. Delect. Anim. Articuli. Brasil., p. 142. A questionable synonym.

*Sphex aurocapillus* Templeton, 1841. Ent. Soc. London, Trans. 3: 51. A questionable synonym.

*Sphex Croesus* Lepeletier, 1845. Hist. Nat. Ins. Hym., v. 3, p. 351. ♀.

*Sphex dimidiatus* Lepeletier, 1845. Hist. Nat. Ins. Hym., v. 3, p. 352. ♂. Preocc.

*Sphex sumptuosa* Costa, 1862. Mus. Zool. Napoli, Ann. 1: 66. ♂. A questionable synonym.

*Sphex ichneumoneus* var. *ignotus* Strand, 1916. Arch. f. Naturgesch. 81: 99. ♀.

Taxonomy: Evans and Lin, 1956. Amer. Ent. Soc., Trans. 81: 139, figs. 1-8 (larva).

Biology: Packard, 1869. Guide Study Ins., pp. 167-168 (nest, prey). —Peckham and Peckham, 1898. Wis. Geol. Nat. Hist. Survey, Bul. 2, Sci. Ser. 1: 33-41, pl. 2, fig. 4, pl. 11, fig. 1, pl. 12, figs. 1-2 (nest, prey). —Rau and Rau, 1918. Wasp studies afield, pp. 193-198, fig. 43 (nest, prey). —Reinhard, 1929. Witchery of wasps, pp. 141-164, 2 pls. (prey). —Abbott, 1931. Iowa Acad. Sci., Proc. 38: 255-258 (nesting behavior). —Frisch, 1937. Amer. Midland Nat. 18: 1043-1062 (nesting aggregation, prey, life cycle, parasite). —Fernald, 1945. Ent. Soc. Amer., Ann. 38: 458-460 (nesting aggregation, prey). —Ristich, 1953. Canad. Ent. 85: 374-386, 1 pl., 4 text figs. (nest, prey, parasites).

Morphology: Snodgrass, 1941. Smithsn. Inst., Misc. Collect. 99, no. 14: 50, pl. 22, figs. K-N, Q, R (male genitalia).

**jamaicensis** (Drury). Fla.; West Indies.

*Vespa Jamaicensis* Drury, 1770. Illus. Nat. Hist., v. 1, p. 104.

*Sphex Jamaica* Christ, 1791. Naturgesch. Class. Nomencl. Ins., p. 292. Emend.



- Sphex auralenta* Guérin, 1835. Iconogr. Regne Anim., Planches Anim. Invert., pl. 70, fig. 2.  
*Lapsus for lanierii* Guer., 1844.  
*Sphex Lanierii* Guérin, 1844. Iconogr. Regne Anim., Ins., v. 3: 433. ♂.  
*Sphex ornata* Lepeletier, 1845. Hist. Nat. Ins., Hym., v. 3, p. 344. ♀, ♂.  
*Sphex ichneumonaeus* var. *fulviventris* Kohl, 1890. K. K. Naturhist. Hofmus., Ann. 5: 431.  
**nudus** Fernald. Md. to Ill., south to Fla. and La. Prey: *Camptonotus carolinensis* Gerst.  
*Sphex nudus* Fernald, 1903. Psyche 10: 201. ♂.  
*Sphex bridwelli* Fernald, 1903. Psyche 10: 202. ♀.  
 Biology: Rau and Rau, 1918. Wasp studies afield, p. 206 (prey).  
**pensylvanicus** Linnaeus. Transcont. in U. S. except northwestern states; northern Mexico.  
 Ecology: Nests in soft earth in sheltered areas, the burrow oblique; several cells provisioned with 2-6 prey specimens. Parasite: *Pseudozenos smithii* (Heyd.); *Senotainia trilineata* (Wulp). Prey: *Microcentrum retinerve* (Burm.), *M. rhombifolium* (Sauss.), *Scudderella furcata* Brunn. This wasp is commonly called "The Great Black Wasp."  
*Sphex pensylvanicus* Linnaeus, 1763. Centuria Ins. Rar., p. 30.  
*Sphex pensylvanicus* var. *robustisoma* Strand, 1916. Arch. f. Naturgesch. 81: 101. ♀.  
 Taxonomy: Evans and Lin, 1956. Amer. Ent. Soc., Trans. 81: 140, figs. 9-11 (larva).  
 Biology: Reinhard, 1929. Witchery of wasps, pp. 165-191, 1 pl., 1 text fig. (nest, prey).  
 —Frisch, 1938. Amer. Midland Nat. 19: 673-677 (nest, prey, life cycle, parasites). —Rau, 1944. Ent. Soc. Amer., Ann. 37: 439-440 (nest, prey). —Krombein, 1955. Brooklyn Ent. Soc., Bul. 50: 16-17 (nesting aggregation, prey).  
**servillei** Lepeletier. Southern Tex. to Argentina.  
*Sphex fuliginosa* Dahlbom, 1843. Hym. Europaea, v. 1, p. 425. Preocc.  
*Sphex Servillei* Lepeletier, 1845. Hist. Nat. Ins. Hym. 3: 336. ♂.  
*Sphex Chichimecus* Saussure, 1867. Reise d. Novara, Zool., v. 2, Hym., p. 40. ♂.  
*Sphex congener* Kohl, 1890. K. K. Naturhist. Hofmus., Ann. 5: 418. ♀.  
*Sphex Joergensenii* Brethes, 1913. Buenos Aires Mus. Nac. de Hist. Nat., An. 24: 120. ♂.  
**tapanecus** Saussure. Tex. to Ariz.; Mexico (Chihuahua). Ecology: Nests gregariously in fine sandy loam soil. Prey: Tettigoniidae sp., nymph.  
*Sphex tapanecus* Saussure, 1867. Reise d. Novara, Zool., v. 2, Hym., p. 41. ♂.  
*Sphex mexicana* Taschenberg, 1869. Ztschr. Gesam. Naturw. Halle 34: 416. ♂. Preocc.  
 Taxonomy: Evans, 1964. Amer. Ent. Soc., Trans. 90: 237-238, figs. 1-4 (larva).  
 Biology: Gillaspay, 1962. Brooklyn Ent. Soc., Bul. 57: 15-17 (nest, prey, mating, cocoon).  
**texanus** Cresson. Kans. to Tex., Ariz.  
*Sphex Texana* Cresson, 1872. Amer. Ent. Soc. Trans. 4: 212. ♀, ♂.

#### Genus SPHEX Subgenus FERNALDINA Bohart and Menke

*Fernaldina* Bohart and Menke, 1963. Univ. Calif. Pubs. Ent. 30: 130.  
 Type-species: *Sphex lucae* Saussure. Monotypic.

Our single species builds a 1-celled nest in the soil which it provisions with nymphal and adult Tettigoniidae.

- lucae** Saussure. Southeastern and western U. S., B. C.; northern Mexico. Ecology: Nests in compacted sandy soil or rocky ground. Parasite: ? *Senotainia* sp. in *trilineata* (Wulp) complex. Prey: *Insara* sp., probably *elegans* Scud., nymphs and adults.  
*Sphex lucae* Saussure, 1867. Reise d. Novara, Zool., v. 2, Hym., p. 41. ♀.  
*Sphex belfragei* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 212. ♀.

Biology: Linsley, 1962. Ent. Soc. Amer., Ann. 55: 156-157, fig. 4 (sleeping aggregation).  
 —Cazier and Mortenson, 1965. Pan-Pacific Ent. 41: 34-43, 6 figs. (nesting behavior, prey, parasite).

#### Genus ISODONTIA Patton

This is the only non-fossorial genus among our native Sphecinae.

## Genus ISODONTIA Subgenus ISODONTIA Patton

*Isodontia* Patton, 1881. Boston Soc. Nat. Hist. Proc. 20: 380.

Type-species: *Sphex philadelphica* Lepeletier. Orig. desig.

*Leontospheer* Arnold, 1945. Sphecidae of Madagascar, p. 90.

Type-species: *Sphex leoninus* Saussure. Monotypic.

**apicalis** (Smith). N. J. to Fla., west to Tex., Tenn., Nebr., Ariz.

*Sphex apicalis* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 262. ♀.

*Isodontia macrocephala* var. *cinerea* Fernald, 1903. Canad. Ent. 35: 271.

*Chlorion (Isodontia) harrisi* Fernald, 1906. U. S. Natl. Mus., Proc. 31: 359. N. name.

**exornata** Fernald. N. C. to Fla., west to Tex.

*Isodontia exornata* Fernald, 1903. Canad. Ent. 35: 270. ♀.

**philadelphica** (Lepeletier). Eastern states, N. Y. to Kans., south to Fla. and Tex., Ariz., Calif.;

Mexico. Ecology: Nests in cavities in log, and in rotten limb. Parasite: *Amobia floridensis* (Tns.). Prey: *Orocharis* sp.

*Sphex philadelphica* Lepeletier, 1845. Hist. Nat. Ins., Hym., v. 3, p. 340. ♀.

*Sphex (Isodontia) macrocephalus* Fox, 1890. Ent. News 1: 137. ♀.

*Sphex aztecus* var. *diguetti* Berland, 1927. Paris Mus. d'Hist. Nat., Bul. 32: 283. ♀.

Taxonomy: Evans and Lin, 1956. Amer. Ent. Soc., Trans. 81: 143, figs. 29, 30 (larva; misdet. as *azteca* Sauss.).

Biology: Bohart and Menke, 1963. Univ. Calif. Pubs. Ent. 30: 135 (nest). —Krombein, 1967.

Trap-nesting wasps and bees, p. 239 (nest).

## Genus ISODONTIA Subgenus MURRAYELLA Bohart and Menke

*Isodontia* Subg. *Murrayella* Bohart and Menke, 1963. Univ. Calif. Pubs. Ent. 30: 137.

Type-species: *Sphex elegans* Smith. Orig. desig.

Species of this subgenus are sometimes called "grass carrier" wasps because they use grass stems and blades to form partitions between cells and to make the closing plug in their nests in cavities in wood, plants and even abandoned bee burrows in clay banks. Other plant materials, such as the fibrous inner bark of certain trees and Spanish moss, are also used in nest construction. Our three species show an interesting evolutionary development in nest structure; *elegans* always makes individual cells separated by partitions, *mexicana* sometimes makes similar nests but usually constructs just one larger brood chamber in which several larvae develop without cannibalism, and *auripes* always makes a nest in which there is just a brood chamber. Our species provision their nests with both Gryllidae and Tettigoniidae, but gryllids of the genus *Oecanthus* are preferred when they are available.

Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 239-251, figs. 57-61 (U. S. spp.).

**auripes** (Fernald). N. Y. to Fla., west to Mich., Kans. and Tex. Ecology: Nests in borings in wood and abandoned bee burrows in clay banks; nest contains only a single large brood cell in which several larvae are reared. Parasite: *Pseudoxenos auripidis* (Pierce); *Anthrax aterrimus* (Big.); Miltogrammini sp.; Phoridae sp.; *Melittobia chalybii* Ashm.; Chrysididae sp. Prey: *Neoxabea bipunctata* (DeG.), *Oecanthus exclamationis* Davis, ? *O. angustipennis* Fitch, *O. latipennis* Riley, *O. sp.*; *Orocharis saltator* Uhl, *O. luteolira* Wlkr., *O. vulgare* Harr., *O. sp.*, *Conocephalus memorale* Scud., *C. sp.*, *Scudderia* sp. Predator: *Lecontella cancellata* (LeC.).

*Sphex tibialis* Lepeletier, 1845. Hist. Nat. Ins., Hym., v. 3, p. 339. ♀. Preocc.

*Chlorion (Isodontia) auripes* Fernald, 1906. U. S. Natl. Mus., Proc. 31: 356. N. name.

Taxonomy: Evans and Lin, 1956. Amer. Ent. Soc., Trans. 81: 144, figs. 31, 32 (larva).

—Evans, 1959. Amer. Ent. Soc., Trans. 85: 147-148 (larva).

Biology: Packard, 1869. Guide Study Ins., pp. 168-169 (nest, cocoon). —Rau and Rau, 1918.

Wasp studies afield, pp. 203-205 (nest). —Rau, 1926. St. Louis Acad. Sci., Trans. 25:

200-201 (nest). —Rau, 1928. St. Louis Acad. Sci., Trans. 25: 362-368 (prey, parasite).

—Krombein, 1967. Trap-nesting wasps and bees, pp. 246-251, ? figs. 60, 61 (nest, prey, life cycle, parasites). —Krombein, 1970. Smithsn. Contrib. Zool. 46: 3-12, figs. 6-39 (nesting behavior, prey, life cycle).

**elegans** (Smith). B. C., U. S. west of 100th Meridian. Ecology: Nests in borings in wood or stems, and in abandoned borings of mining bees, each cell being separated by a partition. Parasite: *Sphaerophthalma ferruginosa* (D. T.), *S. unicolor* (Cr.); *Epistenia caeruleata* Westw.; *Amobia floridensis* (Tns.). Prey: *Oecanthus quadripunctatus* Beut., *O. c. californicus* Sauss., *O. niveus* (DeG.), *O. spp.*; *Dichopetala* sp., ? *Eremopedes* sp.; all nymphs.

*Sphex elegans* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 262. ♂.

Taxonomy: Evans, 1964. Amer. Ent. Soc., Trans. 90: 238-239, figs. 13, 16 (larva).

Biology: Ashmead, 1894. Psyche 7: 64 (prey). —Davidson, 1899. Ent. News 10: 179-180 (nest, prey, parasites). —Fernald, 1906. U. S. Natl. Mus., Proc. 31: 364 (nest, prey, cocoon).

—Ainslie, 1924. Canad. Ent. 56: 269-270 (nest, prey). —Parker and Bohart, 1966.

Pan-Pacific Ent. 42: 94 (nest, parasites). —Krombein, 1967. Trap-nesting wasps and bees, pp. 240-242, fig. 57 (nest, prey, life cycle).

**mexicana** (Saussure). U. S. east of Rockies, Ariz.; Mexico, Central America; introduced into Hawaii, France. Ecology: Nests in borings in wood, hollow stems, pitcher plants and glass tubes; nest usually contains a single large brood cell, but occasionally cells of individual larvae are separated by flimsy partitions. Parasite: *Amobia distorta* (Wulp), *Senotainia trilineata* (Wulp), *S. sp.*, *Sarcophaga* sp.; *Megaselia aletiae* (Comst.); *Eustalomyia vittipes* (Zett.). Prey: *Oecanthus angustipennis* Fitch, *O. quadripunctatus* Beut., *O. argentinus* Sauss., *O. fultoni* Wlkr., *O. nigricornis* Wlkr., *O. niveus* (DeG.), *O. fasciatus* Fitch, *O. spp.*, *Gryllus assimilis* F., *Neorabea bipunctata* (DeG.); *Orocharis saltator* Uhl., *Odontoxiphidium apterum* Morse, *Conocephalus fasciatus* DeG., *C. spp.*, *Neoconocephalus* sp., *Orchelimum* sp., *Rehnia spinosa* Caud.; both adults and nymphs are stored. Predator: *Crematogaster* sp.

*Sphex apicalis* Harris, 1835. In Hitchcock, Rpt. Geol. Mineral. Bot. Zool. Mass., p. 588.

Nom. nud.

*Sphex apicalis* Saussure, 1867. Reise d. Novara, Zool., v. 2, Hym., p. 38. Preocc.

*Sphex apicalis* var. *mexicana* Saussure, 1867. Reise d. Novara, Zool., v. 2, Hym., p. 38. ♀, ♂.

Taxonomy: Evans and Lin, 1956. Amer. Ent. Soc., Trans. 81: 143, figs. 23-28 (larva; misdet. as *harrisi* Fern.). —Evans, 1964. Amer. Ent. Soc., Trans. 90: 239-240 (larva).

Biology: Ashmead, 1895. U. S. Dept. Agr., Insect Life 7: 241 (prey). —Jones, 1904. Ent. News 15: 14-17, 2 pls. (nest, prey). —Engelhardt, 1929. Brooklyn Ent. Soc., Bul. 23: 269-271 (nest, prey). —Rau, 1935. Brooklyn Ent. Soc., Bul. 30: 65-68, 1 pl. (nest, prey, life cycle).

—Suehiro, 1937. Hawaii. Ent. Soc., Proc. 9: 358 (nest, life cycle). —Rau, 1943. Ent. Soc.

Amer., Ann. 36: 648 (nest). —Swezey, 1947. Hawaii. Ent. Soc., Proc. 13: 8 (nest). —Lin,

1962. Tex. Jour. Sci. 14: 429-430 (nest, prey, life cycle). —Medler, 1965. Ent. Soc. Amer.,

Ann. 58: 137-142, 4 figs. (nest, prey, life cycle, cocoon, parasites). —Lin, 1966. Wasmann Jour. Biol. 24: 239-247, 2 figs. (nest, prey, life cycle). —Krombein, 1967. Trap-nesting wasps and bees, pp. 242-246, figs. 58, 59 (nest, prey, life cycle, predator).

## TRIBE PRIONYXINI

### Genus PALMODES Kohl

*Palmodes* Kohl, 1890. K. K. Naturhist. Hofmus., Ann. 5: 112.

Type-species: *Sphex occitanica* Lepeletier and Serville, Desig. by Fernald, 1906.

So far as known these are solitary ground-nesting wasps except for *carbo* which has been reported once as nesting gregariously. Most of our species prey upon Tettigoniidae except for *carbo* which uses Gryllacrididae.

Revision: Bohart and Menke, 1961. Ent. Soc. Wash., Proc. 63: 179-191, 17 figs.

**californicus** Bohart and Menke. Calif., Nev., Oreg., B. C. Prey: Immature adult, *Platylyra californica* Scud., *Neduba morsei* Caud.

*Palmodes californicus* Bohart and Menke, 1961. Ent. Soc. Wash., Proc. 63: 182, figs. 3, 13. ♂, ♀.

- carbo** Bohart and Menke. B. C. to Calif., east to N. W. T., Mont., Colo. and N. Mex. Ecology: Nests gregariously in sand with one cell per nest. Prey: *Cyphoderris monstrosa* Uhl., nymphs. Predator: *Philanthus zebratus nitens* (Bks.).  
*Sphex morio* Kohl, 1890. K. K. Naturhist. Hofmus., Ann. 5: 321. ♂. Preocce.  
*Palmodes carbo* Bohart and Menke, 1963. Univ. Calif. Pubs. Ent. 30: 144. N. name.
- Biology: Evans, 1970. Mus. Compar. Zool., Bul. 140: 483-484 (nest, prey).
- dimidiatus** (DeGeer). U. S. except northwest; Mexico (Chihuahua, Coahuila). Ecology: Nests in sand, the burrow short and oblique, the cell stored with one prey specimen. Prey: *Atlanticus pachymerus* (Burm.), *A. sp.*, *Dissosteira carolina* (L.), *Pediocetes* sp., probably *stevensonii* (Thom.).  
*Sphex dimidiatus* DeGeer, 1773. Mem. pour servir a l'Hist. des Ins. 3: 577, pl. 30, fig. 5. ♂.  
*Sphex violaceipennis* Lepeletier, 1845. Hist. Nat. Ins. Hym., v. 3, p. 349.  
*Sphex rufiventris* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 211. ♀.  
*Sphex abdominalis* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 211. ♂. Preocce.  
*Chlorion* (*Palmodes*) *rufiventris* var. *opuntiae* Rohwer, 1911. U. S. Natl. Mus., Proc. 40: 557. ♀.  
*Sphex* (*Palmodes*) *daggyi* Murray, 1951. U. S. Dept. Agr., Monog. 2: 974. N. name.
- Taxonomy: Evans and Lin, 1956. Amer. Ent. Soc., Trans. 81: 141, figs. 12-14 (larva).
- Biology: Peckham and Peckham, 1898. Wis. Geol. Nat. Hist. Survey, Bul. 2, Sci. Ser. 1: 174-175, pl. 2, fig. 1 (nest, prey). —Williams, 1913. Kans. Univ. Sci. Bul. 8: 227 (prey). —Krombein, 1953 (1952). Wasmann Jour. Biol. 10: 281-282 (nest, prey, life cycle). —Krombein, 1955. Ent. Soc. Wash., Proc. 57: 150-151 (nest, prey, life cycle, cocoon).
- hesperus** Bohart and Menke. Calif. to B. C., Nev., Utah, Wyo., Colo. Ecology: Nests in sandy loam, one cell per nest. Prey: *Anabrus simplex* Hald., nymph.  
*Palmodes hesperus* Bohart and Menke, 1961. Ent. Soc. Wash., Proc. 63: 184, fig. 6. ♂, ♀.
- Biology: Bohart and Menke, 1961. Ent. Soc. Wash., Proc. 63: 185 (prey). —Evans, 1970. Mus. Compar. Zool., Bul. 140: 484 (nest, prey).
- insularis** Bohart and Menke. Calif. (Channel Is.).  
*Palmodes insularis* Bohart and Menke, 1961. Ent. Soc. Wash., Proc. 63: 186. ♂, ♀.
- laeviventris** (Cresson). A Great Basin species, Mont., Wyo. and Colo. west to Wash. and eastern Calif. Ecology: Makes a 1-celled nest and stores 2-4 crickets in it. Parasite: *Sphenometopa tergata* (Coq.); *Stizoides uncinatus* (Say). Prey: *Anabrus simplex* Hald., *Pediocetes* sp., probably *stevensonii* (Thos.).  
*Sphex laeviventris* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 463. ♀, ♂.
- Biology: Williams, 1914 (1913). Kans. Univ. Sci. Bul. 8: 227 (prey). —LaRivers, 1945. Amer. Midland Nat. 33: 743-763 (nest, prey, parasites).
- lissus** Bohart and Menke. Southern Calif., Ariz., Tex.  
*Palmodes lissus* Bohart and Menke, 1961. Ent. Soc. Wash., Proc. 63: 187, figs. 5, 12. ♂, ♀.
- pacificus** Bohart and Menke. Coastal Calif.  
*Palmodes pacificus* Bohart and Menke, 1961. Ent. Soc. Wash., Proc. 63: 188, figs. 8, 9, 14. ♂, ♀.
- praestans** (Kohl). Oreg., Calif., Nev., Utah, Ariz., N. Mex., west. Tex.; Mexico (Coahuila). Prey: *Capnobates fuliginosus* Thom.  
*Sphex* (*Palmodes*) *praestans* Kohl, 1890. K. K. Naturhist. Hofmus., Ann. 5: 323. ♀.
- Biology: Caudell, 1919. Ent. Soc. Wash., Proc. 21: 40 (prey).
- stygicus** Bohart and Menke. Calif., Nev., Utah, Ariz., N. Mex., a Great Basin species.  
*Palmodes stygicus* Bohart and Menke, 1961. Ent. Soc. Wash., Proc. 63: 191, figs. 1, 11, 16. ♂, ♀.

#### Genus PRIONYX Vander Linden

- Prionyx* Vander Linden, 1827. Nouv. Mem. Acad. Roy. Sci. Bruxelles 4: 362.  
 Type-species: *Ammophila kirbii* Vander Linden. Monotypic.  
*Priononyx* Dahlbom, 1843. Hym. Europaea, v. 1, p. 28.  
 Type-species: *Sphex thomae* Fabricius. Monotypic.

*Enodia* Dahlbom, 1843. Hym. Europaea, v. 1, p. 28. Preocc.

Type-species: *Sphex albisectus* Lepeletier and Serville. Desig. by Kohl, 1885.

*Harpactopus* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 264.

Type-species: *Harpactopus crudelis* Smith. Desig. by Patton, 1881.

*Parasphex* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 267.

Type-species: *Sphex albisectus* Lepeletier and Serville. Desig. by Kohl, 1885.

*Gastrosphaeria* Costa, 1858. Fauna Regn. Napoli, Imen. Acul., Sphecoidea, p. 10.

Type-species: *Gastrosphaeria anthracina* Costa. Monotypic.

*Pseudosphex* Taschenberg, 1869. Ztschr. Gesam. Naturw. Halle 34: 420. Preocc.

Type-species: *Pseudosphex pumilio* Taschenberg. Monotypic.

*Calosphex* Kohl, 1890. K. K. Naturhist. Hofmus., Ann. 5: 113.

Type-species: *Sphex niveatus* Dufour. Desig. by Pate, 1937.

*Neosphex* Reed, 1894. Ann. Univ. Chile 85: 627.

Type-species: *Neosphex albospiniferus* Reed. Monotypic.

Our North American species dig simple, shallow unicellular nests in a variety of soil types. The grasshopper prey is captured before the nest is dug, although some extralimital species are known to prepare the nest before capturing the single prey specimen.

Taxonomy: Parker, 1960. Pan-Pacific Ent. 36: 205-208, 1 pl. (key to N. A. spp.).

Biology: Evans, 1958. Ent. Soc. Amer., Ann. 51: 177-186, 3 figs. (nesting behavior).

**atratus** (Lepeletier). Transcont. in southern Canada and all of U. S.; Mexico (Durango).

Ecology: Nests in a variety of soils, the burrow varying from L-shaped to curved to oblique; nest has a single cell and is provisioned with one prey specimen. Parasite:

*Pseudozenos duryi* (Pierce); *Metopia argyrocephala* (Meig.), *Senotainia* sp.; *Stizoides uncinatus* (Say). Prey: *Ageneotettix d. deorum* Scud., *Aulocara elliotti* Thom., *Mermiria neomexicana* Thom., *Arphia zanthoptera* Burm., *Dissosteira carolina* L., *Pardalophora phoenicoptera* Burm., *Spharagemon collare* Scud., *Trimerotropis citrina* Scud., *Melanoplus angustipennis* Dodge, *M. arizonae* Scud., *M. bispinosus* Scud., *M. bivittatus* Say, *M. devastator* Scud., *M. differentialis* Thom., *M. femurrubrum* DeG., *M. foedus* Scud., *M. lakinus* Scud., *M. spretus* Walsh, *M. spp.*, *Schistocerca lineata* Scud. Predator: *Apiomerus spissipes* (Say).

*Sphex labrosa* Harris, 1835. In Hitchcock, Rpt. Geol. Mineral. Bot. Zool. Mass., p. 588.

Nom. Nud.

*Sphex atrata* Lepeletier, 1845. Hist. Nat. Ins., Hym., v. 3, p. 355. ♀.

*Priononyx brunnipes* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 213. ♂.

Taxonomy: Evans and Lin, 1956. Amer. Ent. Soc., Trans. 81: 142, figs. 15-20 (larva). —Evans, 1959. Amer. Ent. Soc., Trans. 75: 147 (larva).

Biology: Peckham and Peckham, 1898. Wis. Geol. Nat. Hist. Survey, Bul. 2: 171-174 (nest, prey). —Bradley, 1908. Ent. Soc. Amer., Ann. 1: 128-129 (sleeping aggregation).

—Williams, 1914 (1913). Kans. Univ. Sci. Bul. 8: 227-230, pl. 33, fig. 2 (nest, prey, parasite).

—Rau and Rau, 1918. Wasp studies afield, pp. 159-175, figs. 36-39 (nest, prey, parasite).

—Rau, 1922. St. Louis Acad. Sci., Trans. 24: 23 (prey). —Strandtmann, 1945. Ent. Soc.

Amer., Ann. 38: 308-310 (nest). —Evans, 1958. Ent. Soc. Amer., Ann. 51: 178-181, fig. 1 (prey transport, nest, parasite, life cycle).

**canadensis** (Provancher). B. C. to Man., south to Calif., Ariz., Colo. and Nebr., Ont., N. J., Va. *Priononyx Canadensis* Provancher, 1887. Addit. Corr. Faune Ent. Canada Hym., p. 258. ♀.

*Sphex excisus* Kohl, 1890. K. K. Naturhist. Hofmus., Ann. 5: 362. ♂.

**fervens** (Linnaeus). Calif. to Tex., south to South America, West Indies. Ecology: Nests in sand, the burrow oblique, the cell horizontal and provisioned with one prey specimen.

Prey: *Xyleus* sp., probably *centralis* Rehn, *Schistocerca cancellata* (Serv.).

*Sphex fervens* Linnaeus, 1758. Syst. Nat., ed. 10, p. 569. ♀. Type from West Indies or Surinam, not Indies.

*Pepsis Johannis* Fabricius, 1804. Systema Piezatorum, p. 208. ♀.

*Sphex Doumerci* Lepeletier, 1845. Hist. Nat. Ins. Hym., v. 3, p. 357. ♀.

*Priononyx striata* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 266.

*Sphex (Priononyx) laerma* Cameron, 1897. Ann. and Mag. Nat. Hist. (6) 19: 370.

- Biology: Evans, 1958. Ent. Soc. Amer., Ann. 51: 184, figs. 2-3 (nest, prey).  
**foxi** Bohart and Menke. Tex., Nev., Utah; northern Mexico.  
*Sphex (Priononyx) ferrugineus* Fox, 1892. Ent. News 3: 170. ♀. Preocc.  
*Prionyx foxi* Bohart and Menke, 1963. Univ. Calif. Pubs. Ent. 30: 152. N. name.
- parkeri** Bohart and Menke. U. S. south to Isthmus of Tehuantepec. Ecology: Nests in a variety of soils, the burrow varying from oblique to nearly vertical, the cell provisioned with one prey specimen. Parasite: *Senotainia rubriventris* Macq. Prey: *Melanoplus scudderii* Uhl., *M. femurrubrum propinquus* Scud., *M. sp.*, probably *femurrubrum* (DeG.), *Trimerotropis citrina* Scud., *Scirtetica marmorata picta* (Scud.), *Chortophaga australior* R. and H.  
*Prionyx parkeri* Bohart and Menke, 1963. Univ. Calif. Pubs. Ent. 30: 154, figs. 35, 54, 96, 102. ♂, ♀.
- Biology: Rau, 1922. Acad. Sci. St. Louis, Trans. 24: 23 (nest, prey; misdet. as *bifoveolatum* Tasch.). — Evans, 1958. Ent. Soc. Amer., Ann. 51: 183-184 (nest, prey, parasite; misdet. as *pubidorsus* Costa). — Linsley, 1962. Ent. Soc. Amer., Ann. 55: 156, fig. 4 (sleeping aggregation; misdet. as *pubidorsum*). — Krombein, 1964. Amer. Mus. Novitates 2201: 18-19 (nest, prey).
- subatratus** Bohart. Oreg. and Idaho south and east to Calif., Utah, Ariz., N. Mex., western Tex.; Mexico (Chihuahua).  
*Priononyx subatratus* Bohart, 1958. Brooklyn Ent. Soc., Bul. 53: 90. ♂, ♀.
- thomae** (Fabricius). Southeastern and western states, south to Argentina. Ecology: Nests in a variety of soils, the burrow varying from L-shaped to curved to oblique; nest with a single cell and provisioned with one prey specimen. Parasite: *Stizoides uncinatus* (Say). Prey: *Amphitornus* sp., *Aulocara* sp., *Orphulella p. pelidna* Burm., *Arphia xanthoptera* Burm., *Dissosteira carolina* L., *Encoptolophus subgracilis texensis* Br., *Paraideмона* sp., probably *fratercula* Heb.  
*Sphex thomae* Fabricius, 1775. Systema Ent., p. 346. ♂.  
*Pepsis crucis* Fabricius, 1804. Systema Piezatorum, p. 209. ♀.  
*Enodia pubidorsum* Costa, 1862. Mus. Zool. Napoli, Ann. 1: 69. ♂.  
*Priononyx thomae* var. *antillarum* Saussure, 1867. Reise d. Novara, Zool., v. 2, Hym., p. 43. ♀.  
*Priononyx thomae* var. *mexicanus* Saussure, 1867. Reise d. Novara, Zool., v. 2, Hym., p. 43. ♀, ♂.  
*Sphex (Harpactopus) Edwardsi* Cameron, 1903. Amer. Ent. Soc., Trans. 29: 230. ♀, ♂.  
*Sphex platensis* Brethes, 1908. Buenos Aires Mus. Nac. de Hist. Nat., An. 17: 146. ♂, ♀.  
*Sphex thomae* var. *altibia* Strand, 1911. Arch. f. Naturgesch. 77, sup. 2: 152. ♂. This is a questionable synonym.
- Taxonomy: Evans and Lin, 1956. Amer. Ent. Soc., Trans. 81: 142, figs. 21, 22 (larva).  
Biology: Hartman, 1905. Tex. Univ., Bul. 65, Sci. Ser. 6: 62-65 (nest, prey, life cycle). — Williams, 1914 (1913). Kans. Univ. Sci. Bul. 8: 227 (prey, sleeping aggregation). — Rau and Rau, 1918. Wasp studies afield, pp. 175-186, figs. 40-42 (nest, prey, parasite). — Evans, 1958. Ent. Soc. Amer., Ann. 51: 181-183 (nest, prey transport, life cycle).

## UNPLACED TAXON OF SPHECINAE

- Sphex instabilis* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 263. ♀. N. Amer. Possibly a senior syn. of *Isodontia exornata* Fern.

## SUBFAMILY AMMOPHILINAE

The North American genera are all fossorial in nesting habits, but one extralimital genus is known to nest in cavities in wood.

Taxonomy: Menke, 1966. Canad. Ent. 98: 147-152, 12 figs. (key to genera).

Genus *PODALONIA* Fernald

- Psammophila* Dahlbom, 1842. Dispos. Method. Spec. Scand. Ins. Hym., pt. 1, pp. 2, 8. Preocc.

Type-species: *Ammophila affinis* Kirby. Desig. by Fernald, 1927.

*Podalonia* Fernald, 1927. U. S. Natl. Mus., Proc. 71 (9): 11.

Type-species: *Ammophila violaceipennis* Lepeletier. Desig. by Internatl. Conn.

Zool. Nomencl., Op. 857, 1968. Op. 857 also suppressed *Podalonia* Spinola, 1853 and validated *Podalonia* Fernald, 1927.

These wasps are fossorial and construct a single cell at the end of a short burrow. They prey upon caterpillars, usually those of the soil-burrowing cutworm type, and place only one prey specimen in the cell.

Revision: Melander, 1903. Psyche 10: 156-164. —Fernald, 1927. U. S. Natl. Mus., Proc. 71 (9): 1-42. —Murray, 1940. Ent. Amer. (n. s.) 20: 1-82.

Taxonomy: Menke, Bohart and van der Vecht, 1966. Bul. Zool. Nomencl. 23: 48-51 (request for suppression of *Podalonia* Spinola, 1853, validation of *Podalonia* Fernald, 1927, and desig. of *Ammophila violaceipennis* Lepeletier as type-species).

**argentifrons** (Cresson). West. States and Provinces. Parasite: *Pseudozenos luctuosae* (Pierce). *Ammophila argentifrons* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 462. ♂.

**argentipilis** (Provancher). Ariz., Calif.

*Pelopoëus argentipilis* Provancher, 1887. Addit. Corr. Faune Ent. Canada Hym., p. 256. ♀.

*Ammophila morrisoni* Cameron, 1888. Biol. Cent.-Amer., Hym., v. 2, p. 21. ♂.

*Psamphophila nicholi* Carter, 1924. Ent. News 35: 366. ♂.

**caerulea** Murray. Calif., Idaho.

*Podalonia caerulea* Murray, 1940. Ent. Amer. (n. s.) 20: 67. ♂.

**clypeata** Murray. West. States to Minn.

*Podalonia clypeata* Murray, 1940. Ent. Amer. (n. s.) 20: 49. ♂, ♀.

Taxonomy: Evans and Lin, 1956. Amer. Ent. Soc., Trans. 81: 144, figs. 33-38 (larva).

**communis communis** (Cresson). U. S. west of 100th meridian; Mexico. Ecology: Nests in sand.

Parasite: *Hilarella hilarella* Zett., *Metopia argyrocephala* (Meig.). Prey: Noctuidae spp., larvae. Predator: *Phylanthus zebratus nitens* (Bks.). Other subsp. occur in Mexico and Central America.

*Ammophila communis* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 462. ♂.

Biology: Newcomer, 1930. Ent. Soc. Amer., Ann. 23: 552-563 2 pls. (nest, prey, parasite, life cycle). —Hicks, 1931. South. Calif. Acad. Sci., Bul. 30: 75-82, pls. 22-25 (nest, prey).

—Hicks, 1931. Pan-Pacific Ent. 8: 49-51 (hibernation). —Hicks, 1932. Psyche 39: 150-154 (nest, prey, parasite). —Evans, 1970. Mus. Compar. Zool., Bul. 140: 484-485 (nest, prey, parasites, predator). The observations by both Newcomer and Hicks on *luctuosa* were made on both *luctuosa* and *c. communis*.

**compacta** Fernald. Calif., Oreg.

*Podalonia violaceipennis* var. *compacta* Fernald, 1927. U. S. Natl. Mus., Proc. 71 (9): 33. ♀, ♂.

**luctuosa** (Smith). Transcont. in northern tier of States and Canada, as far north as N. W. T.

and Yukon. Ecology: Nests in sand. Parasite: *Pseudozenos luctuosae* (Pierce); *Hilarella hilarella* (Zett.), *Metopia argyrocephala* (Meig.), *Taxigramma heteroneura* (Meig.). Prey: *Lycophotia saucia* Hbn., *L. margaritosa* Haw. ?, *Chorizagrotis agrestis* Grt., Noctuidae spp. Predator: *Phylanthus zebratus nitens* (Bks.).

*Ammophila luctuosa* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 224. ♀.

*Psamphophila pacifica* Melander and Brues, 1902. Biol. Bul. 3: 40. ♂.

Biology: Newcomer, 1930. Ent. Soc. Amer., Ann. 23: 552-563, 2 pls. (nest, prey, parasite, life cycle). —Hicks, 1931. South. Calif. Acad. Sci., Bul. 30: 75-82, pls. 22-25 (nest, prey).

—Hicks, 1931. Pan-Pacific Ent. 8: 49-51 (hibernation). —Hicks, 1932. Psyche 39: 150-154 (nest, prey, parasite). The observations by both Newcomer and Hicks on *luctuosa* were made on both *luctuosa* and *c. communis*.

Morphology: Snodgrass, 1941. Smithsn. Inst., Misc. Collect. 99, no. 14: 50, pl. 22, figs. O, P, S, T (male genitalia).

**melaena** Murray. West. States.

*Podalonia melaena* Murray, 1940. Ent. Amer. (n. s.) 20: 34. ♂, ♀.

*mexicana* (Saussure). West. States and Provinces; Mexico.

*Ammophila mexicana* Saussure, 1867. Reise d. Novara, Zool., v. 2, Hym., p. 25. ♂, ♀.

*mickeli* Murray. West. Provinces and States to Minn.

*Podalonia mickeli* Murray, 1940. Ent. Amer. (n. s.) 20: 68. ♂, ♀.

*occidentalis* Murray. Alta., West. States. Prey: Tent-caterpillar.

*Podalonia occidentalis* Murray, 1940. Ent. Amer. (n. s.) 20: 54. ♂, ♀.

Biology: Murray, 1940. Ent. Amer. (n. s.) 20: 13 (prey).

*parallela* Murray. Calif.

*Podalonia parallela* Murray, 1940. Ent. Amer. (n. s.) 20: 65. ♂, ♀.

*pubescens* Murray. Tex. to Ariz.; Mexico.

*Podalonia pubescens* Murray, 1940. Ent. Amer. (n. s.) 20: 47. ♂, ♀.

*puncta* Murray. Kans., Colo., Okla., Tex., N. Mex.

*Podalonia puncta* Murray, 1940. Ent. Amer. (n. s.) 20: 36. ♂, ♀.

*robusta* (Cresson). Transcont. in Canada and U. S., as far north as N. W. T. and Yukon; south to Costa Rica. Prey: Acronyctinae sp. ?

*Ammophila robusta* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 461. ♀.

Biology: Krombein, 1936. Ent. News 47: 93-99 (nest, prey; misdet. as *violaceipennis*).

*sericea* Murray. West. Provinces and States east to the Dakotas, very rare to Mich. Ecology:

Nests along dirt road. Prey: *Zale lunata* (Dru.), *Homoptera salicis* Behr., Noctuidae sp.

*Podalonia sericea* Murray, 1940. Ent. Amer. (n. s.) 20: 57. ♂, ♀.

Taxonomy: Evans, 1964. Amer. Ent. Soc., Trans. 90: 240-241, figs. 5, 8 (larva; misdet. as *robusta*).

Biology: Hicks, 1933. Pan-Pacific Ent. 9: 49-52 (prey; misdet. as *violaceipennis*). — Evans, 1963. Ent. News 74: 237, fig. 4 (nest, prey; misdet. as *robusta*). — Evans, 1970. Mus.

Compar. Zool., Bul. 40: 485, fig. 18 (nest, prey).

*sonorensis* (Cameron). Alta., U. S. west of 100th meridian; Mexico.

*Ammophila sonorensis* Cameron, 1888. Biol. Cent.-Amer., Hym., v. 2, p. 21. ♂, ♀.

*Podalonia sonorensis differentia* Murray, 1940. Ent. Amer. (n. s.) 20: 33. ♂, ♀.

*valida* (Cresson). West. Provinces and States east to Minn. Ecology: Nests in bare or densely vegetated soil, makes cluster of unicellular nests in a restricted site, digs burrow before hunting prey. Parasite: Bombyliidae sp. probably *Ligura* or *Exoprosopa*. Prey:

*Estigmene acraea* (Dru.).

*Ammophila valida* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 461. ♀.

*Ammophila grossa* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 209. ♀.

Biology: Steiner, 1974. Pan-Pacific Ent. 50: 73-77, 1 fig. (prey hunting and transport).

— Steiner, 1975. Quaestiones Ent. 11: 113-127, 6 figs. (female territorial behavior, nest, prey, parasite).

*violaceipennis* (Lepeletier). East. States west to Colo. Ecology: Nests in sand or heavier soil.

Parasite: *Pseudoxenos luctuosae* (Pierce); *Hilarella* sp. Prey: *Symmerista albifrons* S. and A., Noctuidae sp.

*Ammophila violaceipennis* Lepeletier, 1845. Hist. Nat. Ins., Hym., v. 3, p. 370. ♀.

*Ammophila cementaria* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 224. ♀.

Biology: Parker, 1915. Ent. Soc. Wash., Proc. 17: 70-77 (nest, prey, parasite, life cycle).

— Balduf, 1936. Canad. Ent. 68: 137-138 (prey).

### Genus EREMNOPHILA Menke

*Ammophila* subg. *Eremnophila* Menke, 1964. Canad. Ent. 96: 875.

Type-species: *Ammophila opulenta* Guerin. Orig. desig.

*aureonotata* (Cameron). Southern Canada and U. S. east of 100th meridian, south to El Salvador. Ecology: Nests in sand or hard-packed loam, the burrow vertical, terminating in a horizontal cell provisioned with a single caterpillar. Parasite: *Pseudoxenos lugubris* (Pierce). Prey: *Heterocampa guttivitta* (Wlkr.), *H.* sp.; Hesperidae sp.

*Ammophila aureonotata* Cameron, 1888. Biol. Cent.-Amer., Hym., v. 2, p. 7. ♀, ♂.



Biology: Peckham and Peckham, 1898. Wis. Geol. Nat. Hist. Survey, Bul. 2: 25-28 (prey transport, nest; misdet. as *gracilis* Lep.). —Peckham and Peckham, 1905. Wasps, social and solitary, pp. 43-46 (prey transport; misdet. as *gracilis* Lep.). —Rau, 1922. Acad. Sci. St. Louis, Trans. 24: 24 (mating, prey). —Krombein, 1958. Ent. Soc. Wash., Proc. 60: 104 (nest, prey transport). —Evans, 1959. Amer. Midland Nat. 62: 464-465 (nest, prey transport).

### Genus AMMOPHILA Kirby

*Ammophila* Kirby, 1798. Linn. Soc. London, Trans. 4: 199.

Type-species: *Sphex sabulosa* Linnaeus. Desig. by Internatl. Comn. Zool. Nomencl.

Op. 180, 1946. Op. and Decl. by Internatl. Comn. Zool. Nomencl. 2: 569-585.

*Ammophylus* Latreille, 1802-1803. Hist. Nat. Crust. Ins. 3: 332. Emend. or lapsus.

*Miscus* Jurine, 1807. Nouv. Meth. Class. Hym. Dipt., p. 130. No species included.

Type-species: *Ammophila campestris* Latreille. Desig. by Shuckard, 1837.

*Ammophilus* Latreille, 1829. In Cuvier, Regn. Anim., v. 4, p. 322. Emend. or lapsus.

*Coloptera* Lepeletier, 1845. Hist. Nat. Ins., Hym., v. 3, p. 387.

Type-species: *Coloptera barbara* Lepeletier. Monotypic.

*Argyrammophila* Gussakovskij, 1928. Leningrad, Inst. Zool. Appl. Phytopath., Bul. 4: 7.

Type-species: *Ammophila induta* Kohl. Orig. desig.

*Apocnemis* Leclercq, 1961. Eos 37: 211.

Type-species: *Ammophila fallax* Kohl. Orig. desig.

The behavior of these slender, elongate wasps has been studied by a host of observers. All species are fossorial, usually solitary in nesting habits, although a few extralimital species are gregarious nesters. Typically, the nest consists of a short, oblique to perpendicular burrow terminating in a single cell, although 2-celled nests have been reported in two species. Usually, the nest is dug before prey is obtained, but two species have been reported as capturing prey before constructing the nest.

The prey used by *Ammophila* consists usually of hairless larvae although sparsely to densely haired larvae may be used occasionally. Lepidopterous larvae are frequently provided, but occasionally hymenopterous (sawfly) larvae are used. There is one record of weevil larvae being preyed upon by *azteca* Cam. which also uses lepidopterous and sawfly larvae. It is probable that caterpillars are the preferred prey, and that sawfly or weevil larvae are used only when there is not a ready supply of caterpillars. Wasps using larger larvae for prey, store only one per nest; those using smaller larvae may provide as many as 11 per cell. Most species are mass provisioners, but several practice progressive provisioning. Three species, including our native *azteca*, are known to maintain several nests simultaneously which are provisioned progressively.

The Peckhams observed one specimen of *urnaria* Dahlb. using a pebble to tamp the earth in the nest closure. They contended that this constituted improvisation of a tool and intelligent use of it. Subsequent observations on other species demonstrate conclusively that the supposed tool-using behavior is not an intelligent act but the culmination of a succession of instinctive behavioral traits.

Revision: Melander, 1903. Psyche 10: 156-164. —Fernald, 1934. No. Amer. and W. Indies *Sphex*, 167 pp. These are not reliable for identification of many North American species.

Biology: Evans, 1959. Amer. Midland Nat. 62: 449-473 (nesting behavior). —Powell, 1964. Kans. Ent. Soc. Jour. 37: 240-258 (nesting behavior). —Menke, 1965. Ent. News 76: 257-261 (identity of spp. studied by Hicks and Evans).

Morphology: Snodgrass, 1941. Smithsn. Inst., Misc. Collect. 99, no. 14: 50, pl. 23, figs. K, M-R (male genitalia).

*aberti* Haldeman. West. Provinces and States east to Iowa; Mexico. Ecology: Nests in firm sand or hard soil, the vertical or oblique burrow terminating in a cell in which up to 10 small caterpillars are stored. Parasite: *Pseudozenos lugubris* (Pierce); *Hilarella hilarella* (Zett.), *Metopia argyrocephala* (Meig.), *Opsidia* sp.; ? *Exoprosopa capucina* (F.); *Ceratochrysis trachypleura* Boh. Prey: *Euchlaena* sp., Sterrhinae sp., Geometridae spp.; Hesperidae sp.

*Ammophila aberti* Haldeman, 1852. Stansburys Explor. Survey Salt Lake, App. C, Ins., p. 368. ♀.

*Ammophila urnaria* Lepeletier, 1845. Hist. Nat. Ins. Hym., v. 3, p. 381. ♀. Preocc.

*Ammophila tarsata* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 219.

*Ammophila yarrowi* Cresson, 1875. Rpt. Geol. Geol. Explor. and Survey west of 100th meridian, v. 5, p. 713. ♂.

*Spheg transversus* Fernald, 1934. No. Amer. and W. Indies *Spheg*, p. 141. ♂.

Taxonomy: Evans, 1959. Amer. Ent. Soc., Trans. 85: 148, figs. 31-33 (larva).

Biology: Williston, 1892. Ent. News 3: 85-86 (nest, prey). — Hicks, 1932. Canad. Ent. 64:

145-151 (nest, prey, parasites; *Chrysis perpulchra* Cr. misdet.). — Evans, 1959. Amer.

Midland Nat. 62: 454-456 (nest, prey, parasite). — Powell, 1964. Kans. Ent. Soc., Jour. 37: 244-251 (nest, prey, parasite, mating, life cycle).

**acuta** (Fernald). Western U. S.

*Spheg acutus* Fernald, 1934. No. Amer. and W. Indies *Spheg*, p. 150. ♂.

**aphrodite** Menke. Ariz., Nev., Calif.

*Ammophila aphrodite* Menke, 1964. Acta Hym. 2: 8, fig. 2. ♂, ♀.

**azteca** Cameron. Transcont. in Canada and U. S., ranging as far north as N. W. T. and Yukon; Mexico. Ecology: Nest is a vertical burrow ending in a single cell; a female can maintain several nests simultaneously, provisioning each progressively with up to seven prey specimens. Prey: Lycanidae spp.; Gecmetridae spp.; Gelechiidae spp.; Pterophoridae spp.; *Smerinthus* sp.; *Nematus* sp., *Amauronematus* sp.; *Hypera postica* (Gyll.). Predator: *Philanthus zebratus nitens* (Bks.).

*Ammophila azteca* Cameron, 1888. Biol. Cent.-Amer., Hym., v. 2, p. 17. ♀.

*Spheg pilosus* Fernald, 1934. No. Amer. and W. Indies *Spheg*, p. 120. ♀, ♂.

*Spheg aculeatus* Fernald, 1934. No. Amer. and W. Indies *Spheg*, p. 145. ♀, ♂.

*Spheg pilosus nudus* Murray, 1938. Ent. Soc. Amer., Ann. 31: 28. ♂, ♀. Preocc.

*Ammophila pilosa brevisericea* Murray, 1951. U. S. Dept. Agr., Agr. Monog. 2: 976. N. name.

Biology: Hicks, 1933. Canad. Ent. 65: 49-51 (nest, prey, parasite; misdet. as *breviceps* Sm.).

— Hicks, 1935. Pan-Pacific Ent. 11: 99-101 (nest; misdet. as *aculeatus* Fern.). — Evans, 1963. Ent. News 74: 238, fig. 5 (nest, prey). — Powell, 1964. Kans. Ent. Soc., Jour. 37: 244 (prey). — Evans, 1965. Psyche 72: 8-23, 9 figs. (nesting behavior, prey, life cycle).

**azteca clemente** Menke. Calif. (San Clemente Is.).

*Ammophila azteca clemente* Menke, 1967. Los Angeles Co. Mus., Contrib. Sci. 123: 7. ♂, ♀.

**bella** Menke. Ariz.; Mexico (Sonora, Sinaloa, Guerrero, Puebla).

*Ammophila bella* Menke, 1966. Biol. Soc. Wash., Proc. 79: 27. ♂, ♀.

**bellula** Menke. Ariz., N. Mex.; Mexico.

*Ammophila bellula* Menke, 1964. Acta Hym. 2: 17, fig. 10. ♂, ♀.

**boharti** Menke. Calif., Nev.

*Ammophila boharti* Menke, 1964. Acta Hym. 2: 9, fig. 7. ♂, ♀.

**breviceps** Smith. Southwestern U. S.; Mexico. Parasite: *Pseudozenos lugubris* (Pierce); *Spintharosoma mesillae* (Ckll.).

*Ammophila breviceps* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 221. ♀.

**californica** Menke. Western U. S.

*Ammophila californica* Menke, 1964. Acta Hym. 2: 18, fig. 16. ♂, ♀.

**centralis** Cameron. Tex. (Cameron Co.) south to Guatemala.

*Ammophila centralis* Cameron, 1888. Biol. Cent.-Amer., Hym., v. 2, p. 6, pl. 1, fig. 12. ♂.

*Ammophila consors* Cameron, 1888. Biol. Cent.-Amer., Hym., v. 2, p. 12, pl. 2, fig. 3. ♂, ♀.

*Ammophila nigro-caerulea* Cameron, 1888. Biol. Cent.-Amer., Hym., v. 2, p. 12, pl. 1, fig. 8. ♀.

**cleopatra** Menke. Transcont. in U. S.; Mexico. Ecology: Nests in sand, the vertical burrow terminating in a horizontal cell containing one or two prey. Parasite: *Senotainia litoralis* Allen. Prey: *Macruracampa marthesia* (Cram.).

*Ammophila cleopatra* Menke, 1964. Acta Hym. 2: 19, fig. 12. ♂, ♀.

Taxonomy: Evans and Lin, 1956. Amer. Ent. Soc., Trans. 81: 147, figs. 60-62 (larva; misdet. as *juncea* Cr.).

- Biology: Evans, 1959. Amer. Midland Nat. 62: 461-462 (nest, prey, parasite; misdet. as *juncea* Cr.).
- coachella** Menke. Southern Calif., deserts.  
*Ammophila coachella* Menke, 1966. Biol. Soc. Wash., Proc. 79: 38, figs. 2, 5, 6. ♂, ♀.
- conditor** Smith. Fla.  
*Ammophila conditor* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 223. ♀.
- dejecta** Cameron. Ariz.; Mexico (Sonora).  
*Ammophila dejecta* Cameron, 1888. Biol. Cent.-Amer., Hym., v. 2, p. 14.
- dysmica** Menke. Calif., Nev., Oreg., Wyo. Ecology: Nest a vertical burrow ending in a single cell. Prey: Noctuidae sp. Predator: *Phylanthus zebratus nitens* (Bks.).  
*Ammophila dysmica* Menke, 1966. Biol. Soc. Wash., Proc. 79: 30. ♂, ♀.
- Biology: Evans, 1970. Mus. Compar. Zool., Bul. 140: 485 (nest, prey, predator).
- evansi** Menke. Eastern United States. Parasite: *Pseudozenos lugubris* (Pierce). Replaces *arvensis* of American authors, not Dahlbom.  
*Ammophila evansi* Menke, 1964. Acta Hym. 2: 20, fig. 17. ♂, ♀.
- extremitata** Cresson. Western U. S.  
*Ammophila extremitata* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 457. ♀.
- femurrubra** Fox. Southwestern U. S. Parasite: *Spintharosoma mesillae* (Ckll).  
*Ammophila femur-rubra* Fox, 1894. Calif. Acad. Sci., Proc. (2) 4: 102. ♀.
- fernaldi** (Murray). Eastern U. S. west to Man. and Ariz.; Mexico. Ecology: Nests in sandy soil, the cell provisioned with a single larva. Prey: Noctuidae sp.  
*Sphex fernaldi* Murray, 1938. Ent. Soc. Amer., Ann. 31: 19. ♀, ♂.
- Taxonomy: Evans, 1964. Amer. Ent. Soc., Trans. 90: 241-242, figs. 6, 7 (larva).
- Biology: Evans, 1964. Amer. Ent. Soc., Trans. 99: 242 (nest, prey, life cycle).
- ferruginosa** Cresson. Western U. S. except Coastal States.  
*Ammophila ferruginosa* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 455. ♀.  
*Ammophila collaris* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 456. ♂.  
*Sphex cressoni* Smith, 1908. Nebr. Univ., Studies 8: 329. ♂.
- formicoides** Menke. Ariz., N. Mex., Tex.; Mexico (Sonora, Durango).  
*Ammophila formicoides* Menke, 1964. Acta Hym. 2: 10, fig. 3. ♂, ♀.
- harti** (Fernald). Vt. to Alta. to Utah, Tex. Ecology: Nests in sand, the burrow oblique; wasp larva is progressively provisioned. Prey: Ennominae spp., Sterrhinae spp., Geometridae spp.; Noctuidae, probably Acontiinae sp.  
*Ammophila argentata* Hart, 1907. Ill. State Lab. Nat. Hist., Bul. 7: 266. ♀, ♂. Preocc.  
*Sphex harti* Fernald, 1931. Ent. Soc. Amer., Ann. 24: 450. N. name.
- Taxonomy: Evans and Lin, 1956. Amer. Ent. Soc., Trans. 81: 146, figs. 57-59 (larva).
- Biology: Peckham and Peckham, 1900. Wis. Nat. Hist. Soc., Bul. 1: 90-91 (nest, prey; misdet. as *polita* Cr.). —Rau, 1922. Acad. Sci. St. Louis, Trans. 24: 24-26 (nest, prey). —Evans, 1959. Amer. Midland Nat. 62: 459-461 (nest, prey).
- hermosa** Menke. Colo., Nev., Ariz., Calif.; Mexico (Chihuahua).  
*Ammophila hermosa* Menke, 1966. Biol. Soc. Wash., Proc. 79: 31. ♂, ♀.
- hurdi** Menke. Southwestern U. S.  
*Ammophila hurdi* Menke, 1964. Acta Hym. 2: 12, fig. 1. ♂, ♀.
- imitator** Menke. Ariz. (Cochise Co.); Mexico (Sonora).  
*Ammophila imitator* Menke, 1966. Biol. Soc. Wash., Proc. 79: 38, figs. 1, 3. ♂.
- juncea** Cresson. Transcont. in U. S.; Mexico (Sonora).  
*Ammophila juncea* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 460. ♂.  
*Ammophila montezuma* Cameron, 1888. Biol. Cent.-Amer., Hym., v. 2, p. 13. ♂.
- karenae** Menke. Calif., Ariz., N. Mex., Nev., Idaho; Mexico (Baja California).  
*Ammophilaarenae* Menke, 1964. Acta Hym. 2: 21, fig. 9. ♂, ♀.
- kennedyi** (Murray). Entire U. S. and South. Canada. Parasite: *Pseudozenos lugubris* (Pierce).  
*Ammophila vulgaris* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 458. ♀, ♂. Preocc.  
*Sphex kennedyi* Murray, 1938. Ent. Soc. Amer., Ann. 31: 36. N. name.

- leoparda** (Fernald). Minn. southwest to Tex., east to Ga., north to Mich.  
*Sphex urnarius leopardus* Fernald, 1934. No. Amer. and W. Indies *Sphex*, p. 125. ♀, ♂.
- macra** Cresson. Western U. S. Ecology: Nests in firm sandy loam, the burrow vertical with a horizontal cell. Prey: *Smerinthus geminatus* Say.  
*Ammophila macra* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 460. ♂.
- Biology: Evans, 1965. Psyche 72: 21, fig. 9 (nest, prey).
- marshi** Menke. Calif., Nev.  
*Ammophila marshi* Menke, 1964. Acta Hym. 2: 13, fig. 5. ♂, ♀.
- mcclayi** Menke. Calif., Nev.; Mexico (Baja California).  
*Ammophila mcclayi* Menke, 1964. Acta Hym. 2: 24, fig. 13. ♂, ♀.
- mediata** Cresson. Canada and western U. S. as far north as N. W. T. and Yukon. Predator:  
*Philanthus zebratus nitens* (Bks.).  
*Ammophila mediata* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 459. ♀, ♂.
- mescalero** Menke. Tex., Colo., Ariz.; Mexico (Zacatecas, Queretaro, Puebla, Oaxaca).  
*Ammophila mescalero* Menke, 1966. Biol. Soc. Wash., Proc. 79: 33, fig. 7. ♂, ♀.
- mimica** Menke. Southern Calif., Ariz.  
*Ammophila mimica* Menke, 1966. Biol. Soc. Wash., Proc. 79: 36, fig. 4. ♂, ♀.
- moenkopi** Menke. Northern and central Ariz.  
*Ammophila moenkopi* Menke, 1967. Los Angeles Co. Mus., Contrib. Sci. 123: 3, figs. 1, 3. ♂, ♀.
- monachi** Menke. Nev.  
*Ammophila monachi* Menke, 1966. Biol. Soc. Wash., Proc. 79: 34. ♂, ♀.
- murrayi** Menke. Calif.  
*Ammophila murrayi* Menke, 1964. Acta Hym. 2: 14, fig. 4. ♂, ♀.
- nasalis** Provancher. Calif. Ecology: Nests in loose sand of river bed or bank, digging a vertical burrow, the cell provisioned with up to seven caterpillars. Parasite: *Pseudozenos lugubris* (Pierce). Prey: Geometridae sp.  
*Ammophila nasalis* Provancher, 1895. Nat. Canad. 22: 111. ♂.  
*Sphex craspedotus* Fernald, 1934. No. Amer. and W. Indies *Sphex*, p. 96. ♀.
- Biology: Hicks, 1935. Pan-Pacific Ent. 11: 97-99 (nest, prey).
- nearctica** Kohl. Western U. S.  
*Ammophila nearctica* Kohl, 1889. Zool.-Bot. Gesell. Wien, Verh. 39: 18. ♂.
- nefertiti** Menke. Wash., Oreg., Calif., Ariz., Nev., Idaho, a Great Basin sp.  
*Ammophila nefertiti* Menke, 1964. Acta Hym. 2: 16, figs. 8, 11. ♂, ♀.
- nigricans** Dahlbom. Eastern U. S. Ecology: Nests in sandy-clay soil, the burrow oblique or vertical, terminating in a horizontal cell provisioned with one caterpillar. Prey: *Catocala* sp., *Zale* sp., *Euparthenos nubilis* Hbn.  
*Ammophila nigricans* Dahlbom, 1843. Hym. Europaea, v. 1, p. 14. ♂.  
*Ammophila intercepta* Lepeletier, 1845. Hist. Nat. Ins., Hym. v. 3, p. 378. ♀.
- Biology: Rau, 1934. Canad. Ent. 66: 259 (nest, prey). —Strandtmann, 1945. Ent. Soc. Amer., Ann. 38: 310, fig. 6 (nest, prey, life cycle). —Evans, 1959. Amer. Midland Nat. 62: 465 (prey transport).
- novita** (Fernald). Southwestern U. S.; Mexico.  
*Sphex novitus* Fernald, 1934. No. Amer. and W. Indies *Sphex*, p. 147. ♀, ♂.
- parapolita** (Fernald). Wash., Oreg., Idaho, Nev., Utah, Calif.  
*Sphex parapolitus* Fernald, 1934. No. Amer. and W. Indies *Sphex*, p. 51. ♀, ♂.
- parkeri** Menke. Calif., Nev. Prey: Geometridae sp.  
*Ammophila parkeri* Menke, 1964. Acta Hym. 2: 23, fig. 14. ♂, ♀.
- Biology: Powell, 1964. Kans. Ent. Soc., Jour. 37: 243-244 (prey).
- peckhami** (Fernald). Colo. to Ariz.; Mexico.  
*Sphex willistoni* Fernald, 1934. No. Amer. and W. Indies *Sphex*, p. 91, fig. 37. ♀.  
*Sphex peckhami* Fernald, 1934. No. Amer. and W. Indies *Sphex*, p. 93. ♂.
- picipes** Cameron. Ariz. south to Panama.  
*Ammophila alticola* Cameron, 1888. Biol. Cent.-Amer., Hym., v. 2, p. 10, pl. 1, fig. 9a. ♂.

*Ammophila picipes* Cameron, 1888. Biol. Cent.-Amer., Hym., v. 2, p. 11, pl. 2, fig. 4. ♂.

*Ammophila volcanica* Cameron, 1888. Biol. Cent.-Amer., Hym., v. 2, p. 17. ♀.

*Ammophila chiriquensis* Cameron, 1888. Biol. Cent.-Amer., Hym., v. 2, p. 18. ♀.

Biology: Linsley, 1962. Ent. Soc. Amer., Ann. 55: 156, fig. 3 (sleeping aggregation).

**pictipennis** Walsh. Eastern U. S.; Mexico. Ecology: Nests in sand, providing a single larva per nest. Parasite: *Pseudoxenos lugubris* (Pierce); *Hilarella hilarella* (Zett.). Prey: Noctuidae spp., *Leucania unipuncta* (Haw.), *Agrotis C-nigrum* (L.), *Prodenia ornithogalli* Guen., *Heliothis zea* (Bod.); *Pholisora catullus* F.

*Ammophila pictipennis* Walsh, 1869. Amer. Ent. 1: 128, 164. ♀, ♂.

*Ammophila anomala* Taschenberg, 1869. Ztschr. Gesam. Naturw. Halle 34: 434. ♀, ♂.

*Sphex nigropilosus* Rohwer, 1912. U. S. Natl. Mus., Proc. 41: 465. ♀. This is a questionable synonym.

Biology: Walsh and Riley, 1868. Amer. Ent. 1: 128 (nest, prey). —Rau and Rau, 1918. Wasp studies afield, pp. 207-237, figs. 45-49 (prey transport, nest, life cycle). —Rau, 1922. Acad. Sci. St. Louis, Trans. 24: 23 (prey). —Strandtmann, 1945. Ent. Soc. Amer., Ann. 38: 310-311, fig. 7 (nest, prey; misdet. as *placida* Sm.).

**placida** Smith. Western U. S.; Mexico. Ecology: Nests in damp sand, the vertical burrow ending in a horizontal cell. Parasite: *Opsidia* sp. Prey: *Zale lunata* (Dru.), Noctuidae sp.; Hesperidae sp.

*Ammophila placida* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 221. ♂.

Taxonomy: Evans, 1959. Amer. Ent. Soc., Trans. 85: 148, fig. 34 (larva).

Biology: Hicks, 1932. Canad. Ent. 64: 193-198 (nest, prey, life cycle; misdet. as *xanthoptera* Cam.). —Hicks, 1934. South. Calif. Acad. Sci., Bul. 33: 39-41 (prey capture). —Evans, 1959. Amer. Midland Nat. 62: 456-458 (nest, prey transport, life cycle, parasite).

**polita** Cresson. Western U. S.

*Ammophila polita* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 458. ♀.

**procera** Dahlbom. Transcont. in U. S., south to Guatemala. Ecology: Nests in compact sand, the burrow oblique to vertical, terminating in a cell containing one caterpillar. Parasite: *Senotainia vigilans* Allen, *Metopia lateralis* Macq., Miltogrammini sp. Prey: *Nadata gibbosa* (Abbot), *Heterocampa manteo* (Dbldy.), *H. astarte* Dbldy., *Datana* sp., *Schizura ipomoeae* (Dbldy.), *Symmerista* sp.; *Smerinthus cerisyi* Kby., Sphingidae sp.; Noctuidae sp.

*Ammophila procera* Dahlbom, 1843. Hym. Europaea, v. 1, p. 15.

*Ammophila saeva* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 222. ♀.

*Ammophila gryphus* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 460. ♂.

*Ammophila barbata* Smith, 1873. Ann. and Mag. Nat. Hist. (4) 12: 260. ♀.

*Ammophila ceres* Cameron, 1888. Biol. Cent.-Amer., Hym., v. 2, p. 8. ♂.

*Ammophila championi* Cameron, 1888. Biol. Cent.-Amer., Hym., v. 2, p. 9. ♀.

*Ammophila striolata* Cameron, 1888. Biol. Cent.-Amer., Hym., v. 2, p. 10. ♀.

Taxonomy: Evans and Lin, 1956. Amer. Ent. Soc., Trans. 81: 145, figs. 39-46 (larva).

Biology: Pergande, 1892. Ent. Soc. Wash., Proc. 2: 256-258 (nest, prey). —Hartman, 1905. Tex. Univ. Bul. 65, Sci. Ser. 6: 11-20, figs. 6, 8, 9, 13, 16-18, 22 (nest, prey). —Rau and Rau, 1918. Wasp studies afield, pp. 237-243, fig. 50 (nest, prey, sleeping aggregation). —Rau, 1922. Acad. Sci. St. Louis, Trans. 24: 24 (nest). —Criddle, 1924. Canad. Field Nat. 38: 121-123 (nest, prey). —Wheeler and Wheeler, 1924. Science 59: 486 (nest closure). —Rau, 1926. Acad. Sci. St. Louis, Trans. 25: 211 (prey). —Hicks, 1935. Pan-Pacific Ent. 11: 101-102 (nest closure). —Krombein, 1953 (1952). Wasmann Jour. Biol. 10: 283-286 (nest, prey, parasite). —Bohart and Knowlton, 1953. Ent. Soc. Wash., Proc. 55: 100-101 (nest, prey, mating). —Krombein, 1953. Ent. Soc. Wash., Proc. 55: 118 (nest, prey, parasite). —Tilden, 1953. Pan-Pacific Ent. 29: 211-218 (nest, prey). —Krombein, 1955. Ent. Soc. Wash., Proc. 57: 151-152 (cocoon). —Krombein, 1958. Ent. Soc. Wash., Proc. 60: 104-105 (nest, prey, parasite, life cycle). —Evans, 1959. Amer. Midland Nat. 62: 451-454 (nest, prey transport, parasite). —Linsley, 1962. Ent. Soc. Amer., Ann. 55: 156, fig. 4 (sleeping aggregation).

- pruinosa** Cresson. Western U. S. Ecology: Nests in sand, the burrow mostly vertical, the cell progressively provisioned with several caterpillars. Parasite: *Pseudoxenos lugubris* (Pierce). Prey: Geometridae spp.; Noctuidae spp.; Phycitinae sp.  
*Ammophila pruinosa* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 455. ♀, ♂.
- Taxonomy: Evans, 1959. Amer. Ent. Soc., Trans. 85: 149, fig. 35 (larva).
- Biology: Linsley, 1962. Ent. Soc. Amer., Ann. 55: 156 (sleeping aggregation). —Powell, 1964. Kans. Ent. Soc., Jour. 37: 251-253, 256 (nest, prey).
- regina** Menke. Calif., Oreg.  
*Ammophila regina* Menke, 1964. Acta Hym. 2: 25, fig. 15. ♂, ♀.
- shoshone** Menke. Wyo., Utah.  
*Ammophila shoshone* Menke, 1967. Los Angeles Co. Mus., Contrib. Sci. 123: 5, fig. 5. ♂, ♀.
- stangei** Menke. Calif., Nev.  
*Ammophila stangei* Menke, 1964. Acta Hym. 2: 15, fig. 6. ♂, ♀.
- strenua** Cresson. Western Canada and U. S.; Mexico.  
*Ammophila strenua* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 459. ♀.  
*Spheg dubius* Fernald, 1934. No. Amer. and W. Indies *Spheg*, p. 139. Preocc.  
*Ammophila denningi* Murray, 1951. U. S. Dept. Agr., Agr. Monog. 2: 975. N. name.
- unita** Menke. Colo., Wyo., Utah, Nev., Ariz., a Great Basin sp.  
*Ammophila unita* Menke, 1966. Biol. Soc. Wash., Proc. 79: 35. ♂, ♀.
- urnaria** Dahlbom. Eastern U. S. Ecology: Nests in fairly firm soil, the burrow vertical or oblique, the cell provisioned with 1-6 caterpillars. Parasite: *Pseudoxenos lugubris* (Pierce). Prey: *Scoliopteryx libatrix* L., *Autographa* sp., *Panopoda* sp., ? *Polia adjuncta* Bdl.; Ennominae spp., Geometridae spp. The earlier records of *urnaria* listed under Biology may refer to one or more species of *Ammophila*.  
*Ammophila urnaria* Dahlbom, 1843. Hym. Europaea, v. 1, p. 14.  
*Ammophila inepta* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 209. ♀, ♂.  
*Spheg arvensis floridensis* Fernald, 1933. Ent. News 44: 236. Nom. nud.  
*Spheg floridensis* Fernald, 1934. No. Amer. and W. Indies *Spheg*, p. 126. ♀, ♂.
- Taxonomy: Evans and Lin, 1956. Amer. Ent. Soc., Trans. 81: 146, figs. 47-49 (larva).
- Biology: Peckham and Peckham, 1898. Wis. Geol. Nat. Hist. Survey, Bul. 2: 6-28, pl. 3, figs. 5-8, pl. 8, figs. 1-5 (nest, use of "tool", prey, life cycle). —Peckham and Peckham, 1905. Wasps, Social and Solitary, pp. 18-39, 46-50 (nest, use of "tool", prey, life cycle). —Parker, 1915. Ent. Soc. Wash., Proc. 17: 75-76, fig. 8 (nest, prey, life cycle). —Fernald, 1933. Ent. News 44: 236-238 (prey transport, nest). —Frisch, 1940. Amer. Midland Nat. 24: 345-350 (nest closure). —Evans, 1959. Amer. Midland Nat. 62: 462-464 (nest, prey).
- varipes** Cresson. Central U. S.; Mexico (Sonora).  
*Ammophila varipes* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 457. ♀, ♂.  
*Ammophila comanche* Cameron, 1888. Biol. Cent.-Amer., Hym., v. 2, p. 19, pl. 1, fig. 14.
- wrightii** (Cresson). Western U. S. Ecology: Digs vertical burrow in soil after capturing prey.  
Prey: Geometridae sp.  
*Coloptera wrightii* Cresson, 1865. Amer. Ent. Soc., Trans. 1: 378. ♀.
- Biology: Hicks, 1934. Psyche 41: 150-157, 2 figs. (nesting behavior, prey).
- zanthoptera** Cameron. Ariz.; Mexico to Guatemala.  
*Ammophila zanthoptera* Cameron, 1888. Biol. Cent.-Amer., Hym., v. 2, p. 8. ♀.  
*Ammophila trichiosoma* Cameron, 1888. Biol. Cent.-Amer., Hym., v. 2, p. 11. ♂.  
*Ammophila xanthoptera* Cameron, 1900. Biol. Cent.-Amer., Hym., v. 2, p. xi. Emend.

## UNPLACED TAXON OF AMMOPHILINAE

- Ammophila arvensis* Lepeletier, 1845. Hist. Nat. Ins., Hym., v. 3, p. 384. ♀, ♂. Amer. Sept. Preocc. by Dahlbom.

## Family PEMPHREDONIDAE

Members of this family are small for sphecoïd wasps and include the smallest species (2 mm) in the superfamily. The majority of species prey on Homoptera, especially aphids, but some of the smallest species use Thysanoptera or Collembola. The family includes both ground-nesting species and those which use pre-existing cavities in twigs, galls, etc., as nesting sites.

### SUBFAMILY PSENINAE

The revisions listed under the subfamily heading are neither adequate nor reliable for identification of most members of the subfamily.

Revision: Fox, 1898. Amer. Ent. Soc., Trans. 25: 1-18 (N. Amer. spp.). — Malloch, 1933. U. S. Natl. Mus., Proc. 82 (26): 1-60, 2 pls. (N. Amer. spp.).

Taxonomy: Evans, 1959. Amer. Ent. Soc., Trans. 85: 139-145, figs. 1-22 (larvae). — Gittins, 1969. Amer. Ent. Soc., Trans. 95: 49-76, 21 figs. (generic reclassification).

### TRIBE PSENINI

#### Genus AMMOPSEN Krombein

*Ammopsen* Krombein, 1959. Brooklyn Ent. Soc., Bul. 54: 18.

Type-species: *Ammopsen masoni* Krombein. Monotypic.

Nothing is known of the biology except that the sole included species is frequently collected while visiting the flowers of mat *Euphorbia* in the desert. The presence in the female of a foretarsal comb and genal ammochaetae suggests that *masoni* is a ground-nesting species.

*masoni* Krombein. Southern Calif., Ariz., N. Mex., Utah, Nev.

*Ammopsen masoni* Krombein, 1959. Brooklyn Ent. Soc., Bul. 54: 19. ♂, ♀.

#### Genus MIMESA Shuckard

*Mimesa* Shuckard, 1837. Essay on Indig. Fossor. Hym., p. 228.

Type-species: *Trypoxylon equestre* Fabricius. Orig. desig.

*Aporia* Wesmael, 1852. Acad. Roy. Sci. Belg., Bul. 19: 272. Preocc.

Type-species: *Trypoxylon equestre* Fabricius. Desig. by Kohl, 1896.

*Aporina* Gussakovskij, 1937. Trav. Inst. Zool. Acad. Sci. 4: 665. N. name. Preocc.

Wasps of this genus nest in the ground with several cells off the main burrow. So far as known they prey on leafhoppers, both nymphs and adults.

*agalena* Gittins. Calif.

*Mimesa agalena* Gittins, 1966. Ent. News 77: 251. ♀, ♂.

*arizonensis* (Malloch). Ariz. (Tucson, Roosevelt Lake).

*Psen* (*Mimesa*) *arizonensis* Malloch, 1933. U. S. Natl. Mus., Proc. 82 (26): 36. ♂.

*barri* Gittins. Idaho, Oreg., Calif.

*Mimesa barri* Gittins, 1966. Ent. News 77: 249. ♀, ♂.

*basirufa* Packard. Transcont. in Transit. and U. Austr. Zones. Ecology: Nests in flat compacted soil or vertical sand banks. Prey: *Idiocerus* sp. nymphs, *Macropsis viridis* (Fitch) adults, *Oncopsis variabilis* (Fitch) adults, *O. sorbrius* (Wlkr.) adults.

*Mimesa basirufa* Packard, 1867. Ent. Soc. Phila., Proc. 6: 406. ♀.

*Mimesa nebrascensis* Smith, 1908. Nebr. Univ., Studies 8: 390. ♀.

Biology: Krombein, 1961. Brooklyn Ent. Soc., Bul. 56: 64 (nest, prey). — Kurczewski and Lane, 1974. Ent. Soc. Wash., Proc. 76: 377-379, figs. 1, 3 (nest, prey transport, egg).

*coquilletti* (Rohwer). Calif., Nev.

*Psen* (*Mimesa*) *coquilletti* Rohwer, 1910. U. S. Natl. Mus., Proc. 12: 103. ♀ (♂ misdet.).

*cressonii atriventris* (Malloch). Ont. (Toronto).

*Psen* (*Mimesa*) *cressonii* (!) var. *atriventris* Malloch, 1933. U. S. Natl. Mus., Proc. 82 (26): 31. ♂.

- cressonii cressonii** Packard. Transcont. in Transit. and U. Austr. Zones. Ecology: Nests in level sand. Parasite: *Senotainia trilineata* (Wulp). Prey: *Doratura stylata* (Boh.) adults, *Diplocolenus configuratus* (Uhler) adult and nymphs, *Athysanella longicauda* Beirne adults, *Polyamia compacta* (Osborn and Ball) adults, *Laevicephalus melsheimeri* (Fitch) adults, *Scaphytopius* sp. ? nymphs; *Delphacodes campestris* Van Duzee adult, *D. sp.* nymph, *Laccocera vittipennis* Van Duzee adult, *Liburniella ornata* (Stal) adult; *Craspedotepta* sp. adult.  
*Mimesa Cressonii* Packard, 1867. Ent. Soc. Phila., Proc. 6: 405. ♀.  
*Mimesa denticulata* Packard, 1867. Ent. Soc. Phila., Proc. 6: 406. ♂.  
*Mimesa conica* Smith, 1908. Nebr. Univ., Studies 8: 389. "♀" = ♂.
- Biology: Kurczewski and Lane, 1974. Ent. Soc. Wash., Proc. 76: 379-382, figs. 2, 4-6 (nest, prey transport, egg, parasite).
- dawsoni** Mickel. Nebr. (Harrison).  
*Mimesa dawsoni* Mickel, 1916. Amer. Ent. Soc., Trans. 42: 420. ♂.
- edentata** (Malloch). Calif. (San Diego Co.).  
*Psen (Mimesa) edentatus* Malloch, 1933. U. S. Natl. Mus., Proc. 82 (26): 37. ♂.
- ezra** (Pate). Maine, Pa., Md., Wis., Kans., Colo., Wash. Ecology: Nests in sandy soil. Prey: *Exitianus exitiosus* (Uhler).  
*Mimesa argentifrons* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 487. ♀, ♂. Preocc.  
*Psen (Mimesa) ezra* Pate, 1944. Canad. Ent. 76: 133. N. name.
- Biology: Williams, 1914 (1913). Kans. Univ. Sci. Bul. 8: 226, pl. 33, figs. 1, 3 (nest, prey).
- granulosa** (Fox). S. Dak., Mont., Idaho, N. Mex.  
*Psen granulatus* Fox, 1898. Amer. Ent. Soc., Trans. 25: 15. ♂.
- gregaria gregaria** (Fox). Wyo., Colo., N. Mex.  
*Psen gregarius* Fox, 1898. Amer. Ent. Soc., Trans. 25: 16. ♂.
- gregaria simplex** (Malloch). Idaho, Utah, Colo.  
*Psen (Mimesa) gregarius* var. *simplex* Malloch, 1933. U. S. Natl. Mus., Proc. 82 (26): 42. ♀, ♂.
- impressifrons** (Malloch). Wash. (Perry).  
*Psen (Mimesa) impressifrons* Malloch, 1933. U. S. Natl. Mus., Proc. 82 (26): 38. ♂.
- maculipes** Fox. Ont. to Fla.  
*Mimesa maculipes* Fox, 1893. Canad. Ent. 25: 117. ♂.  
*Psen (Mimesa) nigrescens* Rohwer, 1910. Ent. News 21: 168. ♂.  
*Psen (Mimesa) perplexa* Rohwer, 1910. Ent. News 21: 169. ♀.
- pauper** Packard. Transit. Zone east of Rockies.  
*Mimesa pauper* Packard, 1867. Ent. Soc. Phila., Proc. 6: 409. ♂.  
*Mimesa cingulata* Packard, 1867. Ent. Soc. Phila., Proc. 6: 410. ♂.
- polita** (Malloch). Maine, Md., Nebr., N. Mex.  
*Psen (Mimesa) politus* Malloch, 1933. U. S. Natl. Mus., Proc. 82 (26): 35. ♀, ♂.
- proxima** Cresson. Nebr., Colo., N. Mex., Wash.  
*Mimesa proxima* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 188. ♀.
- punctifrons** (Malloch). Calif. (Redlands).  
*Psen (Mimesa) punctifrons* Malloch, 1933. U. S. Natl. Mus., Proc. 82 (26): 36. ♂.
- pygidialis** (Malloch). Mich., Colo., Alta.  
*Psen (Mimesa) pygidialis* Malloch, 1933. U. S. Natl. Mus., Proc. 82 (26): 39. ♀, ♂.
- sabina** Gittins. Calif.  
*Mimesa sabina* Gittins, 1966. Ent. News 77: 247. ♀, ♂.
- unicincta** Cresson. Colo., Calif., B. C. Predator: *Philanthus pulcher* D. T.  
*Mimesa unicincta* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 488. ♀.

#### Genus MIMUMESA Malloch

- Psen* subg. *Mimumesa* Malloch, 1933. U. S. Natl. Mus., Proc. 82 (26): 16.  
 Type-species: *Psen niger* Packard. Orig. desig.



The North American *nigra* (Pack.) nests in decaying timber and preys upon adult *Agallia* leafhoppers. Several species in the Old World have similar nesting habits and one species nests in clay banks. The Old World species prey upon both Cicadellidae and Delphacidae.

*canadensis* (Malloch). Ont., N. Y., Mich., N. Dak., Colo., Alaska.

*Psen (Mimusesa) canadensis* Malloch, 1933. U. S. Natl. Mus., Proc. 82 (26): 22. ♀, ♂.

*clypeata* (Fox). Colo., Utah, Nev., Idaho, Calif., Wash., Alaska, N. W. T.

*Psen clypeatus* Fox, 1898. Amer. Ent. Soc., Trans. 25: 15. ♀, ♂.

*coloradoensis* (Cameron). Colo. (Berkeley Co.).

*Psen (Mimesa) coloradoensis* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 232. ♀.

*cylindrica* (Fox). Ariz.

*Psen cylindricus* Fox, 1898. Amer. Ent. Soc., Trans. 25: 5. ♀, ♂.

*fuscipes* (Packard). Mass.

*Psen fuscipes* Packard, 1867. Ent. Soc. Phila., Proc. 6: 402. ♀.

*interstitialis* (Cameron). N. Mex.

*Psen (Mimesa) interstitialis* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 233. ♂.

*johnsoni* Viereck. N. Y. to Va., W. Va.

*Mimesa johnsoni* Viereck, 1901. Amer. Ent. Soc., Trans. 27: 340. ♀, ♂.

*leucopus* (Say). N. H., Md., D. C., Va., Ind., Ill., Alta.

*Psen leucopus* Say, 1837. Boston Jour. Nat. Hist. 1: 370. ♀, ♂.

*Psen elongatus* Packard, 1867. Ent. Soc., Phila., Proc. 6: 400. "♀" = ♂.

*longicornis* (Fox). R. I., N. Y. to Fla., La., Iowa; Cuba, Cent. Amer.

*Psen longicornis* Fox, 1898. Amer. Ent. Soc., Trans. 25: 8. ♂.

*Mimesa striatus* Viereck, 1901. Amer. Ent. Soc., Trans. 27: 339. ♀.

*Psen (Mimesa) floridana* Rohwer, 1910. Ent. Soc. Wash., Proc. 12: 102. ♀.

*mandibularis* Smith. Nebr.

*Mimesa mandibularis* Smith, 1908. Nebr. Univ., Studies 8: 392. ♀.

*mellipes* (Say). N. Y., Md., D. C., Ohio, Ind., Ill., Iowa, Nebr.

*Psen mellipes* Say, 1837. Boston Jour. Nat. Hist. 1: 369. ♀.

*Psen chalcifrons* Packard, 1867. Ent. Soc. Phila., Proc. 6: 401. ♀.

*mixta* (Fox). Transcont. in Transit. Zone. Predator: *Philanthus pulcher* D. T.

*Psen mixtus* Fox, 1898. Amer. Ent. Soc., Trans. 25: 7. ♀, ♂.

*Mimesa alticola* Viereck, 1903. Amer. Ent. Soc., Trans. 29: 65. ♀.

*Psen (Mimesa) similis* Rohwer, 1910. Ent. Soc. Wash., Proc. 12: 101. ♂.

*nigra* (Packard). Transcont. in Transit. Zone. Ecology: Nests in decaying wood. Prey: *Agallia* sp. adults.

*Psen niger* Packard, 1867. Ent. Soc. Phila., Proc. 6: 399. ♀ (♂ misdet.).

Taxonomy: Evans, 1959. Amer. Ent. Soc., Trans. 85: 143-144, figs. 21-22 (larva).

Biology: Gurney, 1951. Ent. Soc. Wash., Proc. 53: 280 (nest, prey).

*propinqua* Kincaid. Alaska.

*Mimesa propinqua* Kincaid, 1900. Wash. Acad. Sci., Proc. 2: 508. ♂.

*psychrus* (Pate). Canada (Hudson Bay).

*Mimesa borealis* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 431. ♂. Preocc.

*Psen (Mimesa) psychrus* Pate, 1944. Canad. Ent. 76: 133. N. name.

*regularis* (Fox). N. J., Pa.

*Psen regularis* Fox, 1898. Amer. Ent. Soc., Trans. 25: 6. ♀.

Taxonomy: Viereck, 1901. Amer. Ent. Soc., Trans. 27: 339. ♀.

### Genus PSENEO Malloch

*Psen* subg. *Pseneo* Malloch, 1933. U. S. Natl. Mus., Proc. 82 (26): 7.

Type-species: *Psen kohlii* Fox. Orig. desig.

Meager records indicate that these wasps nest either in the soil or in decaying wood, and prey upon leafhoppers, both nymphs and adults.

- Revision: Krombein, 1950. Ent. Soc. Wash., Proc. 52: 277-287 (N. Amer. spp.). — van Lith, 1975. Tijdschr. v. Ent. 118: 15-39, figs. 16-37 (New World spp.).
- longiventris kohlii** (Fox). N. Y. south to Ga., W. Va., Ala., Ind., Kans.  
*Psen kohlii* Fox, 1898. Amer. Ent. Soc., Trans. 25: 9. ♀ (♂ misdet.).  
*Psen (Pseno) fulvipes* Malloch, 1933. U. S. Natl. Mus., Proc. 82 (26): 11, fig. 3. ♀.  
*Psen (Pseno) angulatus* Malloch, 1933. U. S. Natl. Mus., Proc. 82 (26): 12. ♂.
- Morphology: Snodgrass, 1941. Smithsn. Inst., Misc. Collect. 99 (14): pl. 22, figs. E-J (male genitalia).
- longiventris longiventris** (Cameron). N. Mex., Ariz. south to Colombia and Surinam.  
*Mimesa longiventris* Cameron, 1891. Biol. Cent.-Amer., Hym., v. 2, p. 137, pl. 8, fig. 18. "♀"  
 = ♂.  
*Mimesa montezuma* Cameron, 1891. Biol. Cent.-Amer., Hym., v. 2, p. 138. ♀.  
*Psen (Pseno) spicatus* Malloch, 1933. U. S. Natl. Mus., Proc. 82 (26): 12. ♂.
- punctatus carolina** (Rohwer). Va. to north. Fla., Ala., Miss., Ark. Ecology: Nests in soil in flowerpot. Prey: *Homalodisca triquetra* (F.), *Graphocephala coccinea* (Foerster).  
*Psen (Mimesa) punctata* var. *carolina* Rohwer, 1910. Ent. Soc. Wash., Proc. 12: 103. ♀.
- Biology: Krombein, 1950. Ent. Soc. Wash., Proc. 52: 283 (nest, prey).
- punctatus ferrugineus** (Viereck). South. Fla.  
*Mimesa ferruginea* Viereck, 1901. Amer. Ent. Soc., Trans. 27: 341. ♂.
- punctatus punctatus** (Fox). S. Dak., Nebr., Colo.; Mexico (Morelos).  
*Psen punctatus* Fox, 1898. Amer. Ent. Soc., Trans. 25: 9. ♀.
- simplicicornis** (Fox). Que., N. J. and Pa. south to N. C. Ecology: Nests in decaying wood; cocoons of reared series bear fragments of wood pulp. Prey: *Graphocephala* sp., Cicadellinae sp.  
*Psen simplicicornis* Fox, 1898. Amer. Ent. Soc., Trans. 25: 10. ♀ (♂ misdet.).
- Taxonomy: Evans, 1959. Amer. Ent. Soc., Trans. 85: 142 (larva).
- Biology: Krombein, 1950. Ent. Soc. Wash., Proc. 52: 286 (nest). — Krombein, 1951. U. S. Dept. Agr., Agr. Monog. 2: 959 (prey).

#### Genus *PSEN* Latreille

- Psen* Latreille, 1796. Precis Caract. Gen. Ins., p. 122. No species.  
 Type-species: *Sphex atra* Fabricius. First included species.
- Psenia* Stephens, 1829. System. Cat. Brit. Ins., p. 361.  
 Type-species: *Sphex atra* Fabricius. Desig. by Pate, 1937.
- Dahlbomia* Wissman, 1849. Stettin. Ent. Ztg. 10: 9.  
 Type-species: *Sphex atra* Fabricius. Monotypic.
- Mesopora* Wesmael, 1852. Acad. Roy. Sci. Belg., Bul. 19: 279.  
 Type-species: *Sphex atra* Fabricius. Monotypic.
- Caenopsen* Cameron, 1899. Ann. and Mag. Nat. Hist. (7) 4: 55.  
 Type-species: *Caenopsen fuscineris* Cameron. Monotypic.
- Punctipsen* van Lith, 1968. Tijdschr. Ent. 111: 125.  
 Type-species: *Mimesa exarata* Eversmann. Orig. desig.
- The North American *barthi* Vier. nests in dead wood and preys upon Membracidae, and *erythropoda* Roh. preys upon Cercopidae. Extralimital species have been reported as nesting in dead wood or in sandy or clay soil, and as preying upon Cicadellidae, Cercopidae and Membracidae.
- Revision: van Lith, 1975. Tijdschr. v. Ent. 118: 2-15, figs. 1-15 (New World spp.).
- barthi** Viereck. Que., Conn., Pa., Md., Ga., Wis. Ecology: Nests in wood. Prey: *Cyrtolobus fenestratus* (Fitch); *Atymna inornata* (Say); *Micrutalis calva* (Say); cocoons from which type series of *myersiana* was reared bear attached fragments of Membracidae, perhaps *Enchenopa binotata* (Say).  
*Psen (Mimesa) barthi* Viereck, 1907. Wis. Nat. Hist. Soc., Bul. 5: 251. ♀.  
*Mimesa myersiana* Rohwer, 1909. Ent. News 20: 324. ♀, ♂.
- Taxonomy: Evans, 1959. Amer. Ent. Soc., Trans. 85: 142-143, fig. 20 (larva).

Biology: Barth, 1907. Wis. Nat. Hist. Soc., Bul. 5: 251-257 (nest, prey).

**erythropoda** Rohwer. Ont., Maine to Ga., Wis., Ind. Prey: *Aphrophora quadrinotata* Say.

*Psen (Mimesa) erythropoda* (!) Rohwer, 1910. Ent. Soc. Wash., Proc. 12: 102. ♀.

*Psen (Mimesa) erythropoda* Rohwer, 1910. Ent. Soc. Wash., Proc. 12: 176. Emend.

Biology: Malloch, 1933. U. S. Natl. Mus., Proc. 82 (26): 15 (prey).

**monticola** (Packard). Ont., N. H. to Ga., W. Va., Mich., Ala.

*Mimesa monticola* Packard, 1867. Ent. Soc. Phila., Proc. 6: 407. ♂.

**unifasciculatus** Malloch. N. Mex. (Beulah). Possibly the opposite sex of and a synonym of *montivagus* D. T.

*Psen (Psen) unifasciculatus* Malloch, 1933. U. S. Natl. Mus. Proc. 82 (26): 15. ♂.

## TRIBE PSENLINI

### Genus PLUTO Pate

*Psenia* Malloch, 1933. U. S. Natl. Mus., Proc. 82 (26): 44. Preocc.

Type-species: *Mimesa tibialis* Cresson. Orig. design.

*Pluto* Pate, 1937. Amer. Ent. Soc., Mem. 9: 51. N. name.

Biological notes are available for only one species which nests in large aggregations in sandy soil and preys upon nymphal and adult leafhoppers. The presence of a foretarsal pecten in the female suggests that members of the genus are all ground-nesting.

**aerofacies** (Malloch). Tex.; Mexico.

*Psenia aerofacies* Malloch, 1933. U. S. Natl. Mus., Proc. 82 (26): 49. ♀, ♂.

**albifacies** (Malloch). Iowa, Tex. Ecology: Nests gregariously in flat clay-sand, each nest with several cells and 5-12 prey per cell. Prey: *Opsius stactogalus* Fieb., nymphs and adults.

*Psenia albifacies* Malloch, 1933. U. S. Natl. Mus., Proc. 82 (26): 50. ♀.

Taxonomy: Evans, 1959. Amer. Ent. Soc., Trans. 85: 140-141, figs. 1-6 (larva).

Biology: Evans, 1968. Ent. Soc. Amer., Ann. 61: 1344 (nest, prey).

**angulicornis** (Malloch). Tex.

*Psenia angulicornis* Malloch, 1933. U. S. Natl. Mus., Proc. 82 (26): 58. ♀, ♂.

**arenivagus** Krombein. N. C., Ga., Fla.

*Psenia angulicornis* var. Malloch, 1933. U. S. Natl. Mus., Proc. 82 (26): 48 (in key).

*Pluto arenivagus* Krombein, 1950 (1949). Elisha Mitchell Sci. Soc., Jour. 65: 268. ♀, ♂.

**brevipetiolatus** (Rohwer). Calif.

*Psenulus (Neofoxia) brevipetiolatus* Rohwer, 1910. Ent. Soc. Wash., Proc. 12: 100. ♀.

**clavicornis** (Malloch). Ariz.; Mexico.

*Psenia clavicornis* Malloch, 1933. U. S. Natl. Mus., Proc. 82 (26): 50. ♂.

**littoralis** (Malloch). Md., Fla.

*Psenia littoralis* Malloch, 1933. U. S. Natl. Mus., Proc. 82 (26): 56. ♀, ♂.

**longiventris** (Malloch). Ariz., Calif.

*Psenia longiventris* Malloch, 1933. U. S. Natl. Mus., Proc. 82 (26): 52. ♀, ♂.

**marginatus** (Malloch). S. C., La.

*Psenia marginatus* Malloch, 1933. U. S. Natl. Mus., Proc. 82 (26): 54. ♀, ♂.

**minutus** (Malloch). Tex. (San Diego).

*Psenia minuta* Malloch, 1933. U. S. Natl. Mus., Proc. 82 (26): 59. ♀.

**pallidistigma** (Malloch). Ariz., Tex.

*Psenia pallidistigma* Malloch, 1933. U. S. Natl. Mus., Proc. 82 (26): 52. ♀, ♂.

**rufibasis** (Malloch). Ga.

*Psenia rufibasis* Malloch, 1933. U. S. Natl. Mus., Proc. 82 (26): 53. ♀, ♂.

**sayi** (Rohwer). Austr. Zone.

*Psenulus (Neofoxia) sayi* Rohwer, 1910. Ent. Soc. Wash., Proc. 12: 100. ♀.

**suffusus** (Fox). N. Mex., Nev., Calif.

*Psen suffusus* Fox, 1898. Amer. Ent. Soc., Trans. 25: 18. ♀ (misdet. in part).

**texasus** (Malloch). Tex. (Brownsville).

*Psenia texana* Malloch, 1933. U. S. Natl. Mus., Proc. 82 (26): 56. ♀, ♂.

**tibialis** (Cresson). D. C., Va., S. C., Tenn., Ala., La., Mo., Tex.

*Mimesa tibialis* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 227. ♀, ♂.

### Genus **PSENULUS** Kohl

*Psenulus* Kohl, 1896. K. K. Naturhist. Hofmus., Ann. 11: 254, 293.

Type-species: *Psen fuscipennis* Dahlbom. Desig. by Ashmead, 1899.

*Neofoxia* Viereck, 1901. Amer. Ent. Soc., Trans. 27: 338.

Type-species: *Psen atrata* (Fabricius) of Panzer. Orig. desig.

*Stenomellinus* Schulz, 1911. Zool. Ann. 4: 142.

Type-species: *Psen dilectus* Saussure. Monotypic.

*Psenulus* subg. *Eopsenulus* Gussakovskij, 1934. Mushi 7: 84.

Type-species: *Psenulus (Eopsenulus) iwatai* Gussakovskij. Orig. desig.

*Nipponopsen* Yasumatsu, 1938. Mushi 11: 84.

Type-species: *Nipponopsen anomoneurae* Yasumatsu. Orig. desig.

These wasps nest in pre-existing cavities in twigs, stems and grass, and also in abandoned beetle borings in wood. Prey records of North American species are Aphididae and Psyllidae. Some extralimital species prey upon Delphacidae and Cicadellidae.

Revision: Krombein, 1950. Brooklyn Ent. Soc., Bul. 45: 35-40 (N. Amer. spp.).

**alienus** (Krombein). Calif. Ecology: Nests in borings in *Sambucus* stems. Prey: Psyllidae sp. adults.

*Diodontus (Diodontus) alienus* Krombein, 1950. Brooklyn Ent. Soc., Bul. 45: 38. ♀.

Biology: Parker and Bohart, 1966. Pan-Pacific Ent. 42: 94 (nest, prey).

**frontalis** (Fox). Colo., N. Mex., Ariz., Utah, Calif., Wash.

*Psen frontalis* Fox, 1898. Amer. Ent. Soc., Trans. 25: 4. ♀.

*Diodontus occidentalis* Malloch, 1933. U. S. Natl. Mus., Proc. 82 (26): 5. ♀. Preocc.

*Diodontus hesperus* Pate, 1944. Canad. Ent. 76: 133. N. name.

**pallipes** **parenosus** (Pate). N. H. to Ga., Utah, Calif. Ecology: Nests in borings in wood, in old anobiid borings, and in canes of *Rubus*. Parasite: *Pyemotes ventricosus* (Newp.); *Lackerbaeria krombeini* Baker; Chrysididae sp., possibly *Omalus*. Prey: *Drepanaphis acerifoliae* (Thos.) adults, *D. sp.* nymphs, *Therioaphis sp. ?* nymphs, *Macrosiphum sp.* nymphs. Typical *pallipes* (Panz.) and other subspecies occur in the Palaearctic Region. *Diodontus parenosus* Pate, 1944. Canad. Ent. 76: 133. N. name for Malloch's misdet. of *trifulcus* (Fox).

Taxonomy: Krombein, 1950. Brooklyn Ent. Soc., Bul. 45: 37 (lectotype desig.). —Evans, 1959. Amer. Ent. Soc., Trans. 85: 144-145, figs. 13-19 (larva).

Biology: Krombein, 1951. U. S. Dept. Agr., Agr. Monog. 2: 958 (nest). —Krombein, 1955. Brooklyn Ent. Soc., Bul. 50: 15-16 (nest, prey). —Krombein, 1958. Biol. Soc. Wash., Proc. 71: 22 (nest, prey). —Krombein, 1967. Trap-nesting wasps and bees, pp. 232-234 (nest, prey, life cycle, cocoon, parasites).

**trifulcus** (Fox). N. H. to Tenn., Mo., Kans. Ecology: Nests in elder stems. Parasite: *Omalus iridescens* (Nort.).

*Psen trifulcus* Fox, 1898. Amer. Ent. Soc., Trans. 25: 5. ♀.

*Diodontus corusanigrens* Rohwer, 1920. U. S. Natl. Mus., Proc. 57: 228. "♀" = ♂.

*Diodontus sulcatus* Malloch, 1933. U. S. Natl. Mus., Proc. 82 (26): 6. ♀.

Taxonomy: Pate, 1944. Canad. Ent. 76: 133.

Biology: Rau, 1922. Acad. Sci. St. Louis, Trans. 24: 21-22 (nest).

### SUBFAMILY PEMPHREDONINAE

Revision: Fox, 1892. Amer. Ent. Soc., Trans. 19: 307-326 (N. Amer. spp.; not reliable for identification).

Taxonomy: Pate, 1937. Amer. Ent. Soc., Trans. 63: 90-93 (key to gen.). — Evans, 1958. Amer. Ent. Soc., Trans. 84: 126-136, figs. 49-57, 60-69 (larvae). — Evans, 1964. Amer. Ent. Soc., Trans. 90: 246-253, figs. 17-25 (larvae).

# TRIBE PEMPHREDONINI

## Genus DIODONTUS Curtis

*Diodontus* Curtis, 1834. Brit. Ent., v. 11, text for pl. 496.

Type-species: *Pemphredon tristis* Vander Linden. Desig. by Internatl. Comn. Zool. Nomencl., 1968. Op. 844, Bul. Zool. Nomencl. 25: 10.

*Xylocelia* Rohwer, 1915. U. S. Natl. Mus., Proc. 49: 243.

Type-species: *Diodontus occidentalis* Fox. Orig. desig.

Members of this genus nest in the ground. Aphids are the normal prey, but there is one record of a leafhopper being used.

Taxonomy: Mickel, 1916. Ent. Soc. Amer., Ann. 9: 344-352 (N. Amer. spp.). — Krombein, 1939. Brooklyn Ent. Soc., Bul. 34: 143 (key to N. Y. spp.). — Bohart and Menke, 1965. Bul. Zool. Nomencl. 22: 257-258 (request to place *Diodontus* on Official List of Generic Names with *tristis* as type-species).

**adamsi** Titus. Mich. (Isle Royale).

*Diodontus adamsi* Titus, 1909 (1908). Mich. Board Geol. Survey Rpt. for 1908, p. 319. ♀.

**americanus** Packard. Maine, Wis. Ecology: Nests in soil. Prey: Choke-cherry aphids.

*Diodontus americanus* Packard, 1867. Ent. Soc. Phila., Proc. 6: 393. ♀.

Biology: Peckham and Peckham, 1898. Wis. Geol. Nat. Hist. Survey, Bul. 2: 99-107, pl. 10, fig. 5, pl. 14, fig. 3 (nest, prey, life cycle).

**antennatus** (Mickel). Nebr. (Omaha).

*Xylocelia antennatus* Mickel, 1916. Ent. Soc. Amer., Ann. 9: 348. ♀.

**argentinae** Rohwer. Colo., Wyo. Ecology: Nests gregariously in flat sand and makes up to 5 cells per nest. Parasite: Diptera sp. Prey: Aphididae sp. or spp. Predator: *Philanthus pulcher* D. T.

*Diodontus argentinae* Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 104. ♂.

Biology: Evans, 1970. Mus. Compar. Zool., Bul. 140: 486 (nest, prey, parasite, predator).

**ater** (Mickel). Nebr., Kans., Pa. Ecology: Nests in vertical sand or clay bank, and in sloping gravel bank. Prey: Aphididae sp. or spp. Predator: *Philanthus pacificus* Cr.

*Xylocelia ater* Mickel, 1916. Ent. Soc. Amer., Ann. 9: 351. ♀.

Biology: Rau, 1922. Acad. Sci. St. Louis, Trans. 24: 21 (nest). — Evans, 1970. Mus. Compar. Zool., Bul. 140: 486-487 (nest, prey, predator).

**beulahensis** (Rohwer). N. Mex. (Beulah).

*Xylocelia beulahensis* Rohwer, 1917. U. S. Natl. Mus., Proc. 53: 174. ♀.

**bidentatus** Rohwer. N. B., N. Y., Mich.

*Diodontus bidentatus* Rohwer, 1911. U. S. Natl. Mus., Proc. 40: 560. ♂.

**brunneicornis** Viereck. Kans. (Sedgwick Co.).

*Diodontus brunneicornis* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 212. ♂.

**cockerelli** Rohwer. Colo. (Florissant).

*Diodontus cockerelli* Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 105. ♂.

**crassicornus** Viereck. Oreg. (Corvallis).

*Diodontus crassicornus* Viereck, 1904. Amer. Ent. Soc., Trans. 30: 243. ♂.

**flavitarsis** Fox. Colo.

*Diodontus flavitarsis* Fox, 1892. Amer. Ent. Soc., Trans. 19: 316. ♂.

**florissantensis** Rohwer. Colo. (Florissant).

*Diodontus florissantensis* Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 107. ♀, ♂.

**franclemonti** (Krombein). N. Y., Pa., Md., D. C., Va., Mich. Ecology: Nests gregariously in sand.

*Xylocelia franclemonti* Krombein, 1939. Brooklyn Ent. Soc., Bul. 34: 141. ♀, ♂.

- Taxonomy: Evans, 1958. Amer. Ent. Soc., Trans. 84: 133, figs. 65, 66 (larva).  
 Biology: Lin, 1967. Ent. Soc. Wash., Proc. 69: 343-346 (linear copulation).  
**fraternus** Rohwer. Colo. (Florissant).  
*Diodontus fraternus* Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 106. ♂.  
**gillettei** Fox. Nebr., Colo., Idaho. Predator: *Philanthus pulcher* D. T., *P. pacificus* Cr.  
*Diodontus Gillettei* Fox, 1892. Amer. Ent. Soc., Trans. 19: 316. ♀.  
**leguminiferus** Cockerell. N. Mex. (Santa Fe).  
*Diodontus leguminiferus* Cockerell, 1897. In Cockerell and Fox, Acad. Nat. Sci. Phila., Proc. 49: 141. ♂.  
**maestus** Mickel. Nebr., Colo.  
*Xylocelia maestus* Mickel, 1916. Ent. Soc. Amer., Ann. 9: 347. ♂.  
**metathoracicus** (Mickel). Ala., Mo., Nebr. Ecology: Nests in clay bank, the cell with up to 48 aphids. Prey: *Hysteroneura setariae* (Thos.).  
*Xylocelia metathoracicus* Mickel, 1916. Ent. Soc. Amer., Ann. 9: 349. ♀.  
 Biology: Rau and Rau, 1918. Wasp Studies Afield, pp. 102-108, figs. 27, 28 (nest, prey, mating).  
**neomexicanus** Rohwer. N. Mex. (Rowe).  
*Diodontus neomexicanus* Rohwer, 1909. Amer. Ent. Soc., Trans. 19: 317. ♀.  
**nigritus** Fox. Colo.  
*Diodontus nigritus* Fox, 1892. Amer. Ent. Soc., Trans. 19: 317. ♀.  
**occidentalis** Fox. Nebr., Ariz., Calif. Ecology: Nests gregariously in level sand, the cells provisioned with 23-30 aphids. Parasite: *Omalus cressoni* (Aar.). Prey: *Aphis* sp., *Myzus persicae* Sulz. (?), *Macrosiphum (Acyrthosiphon)* sp., *Rhopalosiphum* sp.  
*Diodontus occidentalis* Fox, 1892. Amer. Ent. Soc., Trans. 19: 315. ♀, ♂.  
 Biology: Powell, 1964. Wasmann Jour. Biol. 21: 155-176 (nest, prey, parasites, mating, life cycle, cocoon).  
**rugosus** Fox. Ill., Nebr., Colo., Mont.  
*Diodontus rugosus* Fox, 1892. Amer. Ent. Soc., Trans. 19: 315. ♂.  
**siouxensis** (Mickel). Nebr. (Sioux Co.).  
*Xylocelia siouxensis* Mickel, 1916. Ent. Soc. Amer., Ann. 9: 350. ♀.  
**spiniferus** (Mickel). Nebr. (Omaha).  
*Xylocelia spiniferus* Mickel, 1916. Ent. Soc. Amer., Ann. 9: 348. ♀.  
**striatus** (Mickel). N. Dak., Wyo.  
*Xylocelia striatus* Mickel, 1916. Ent. Soc. Amer., Ann. 9: 350. ♀.  
**vallicolae** Rohwer. Colo. (Florissant, Boulder).  
*Diodontus vallicolae* Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 104. ♂.  
*Diodontus vallicolae salicis* Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 105. ♂.  
**virginianus** (Rohwer). N. Y., Md., Va. Ecology: Nests gregariously in flat soil, or in pockets of soil between roots, the cell provisioned with up to 5 aphids. Parasite: *Omalus intermedius* (Aar.). Prey: *Prociphilus tessellatus* (Fitch) nymphs; *Typhlocyba* sp. adult.  
*Xylocelia virginiana* Rohwer, 1917. U. S. Natl. Mus., Proc. 53: 175. ♂.  
 Taxonomy: Evans, 1958. Amer. Ent. Soc., Trans. 84: 133, fig. 67 (larva).  
 Biology: Krombein, 1951. U. S. Dept. Agr., Agr. Monog. 2: 964 (prey). — Krombein, 1958. Biol. Soc. Wash., Proc. 71: 22-24 (nest, prey). — Krombein, 1963. Ent. Soc. Wash., Proc. 65: 264 (parasite).

### Genus PEMPHREDON Latreille

The species nest in twigs, deserted galls, abandoned beetle burrows, or in rotten wood and provision the cells with Aphididae.

### Genus PEMPHREDON Subgenus PEMPHREDON Latreille

*Pemphredon* Latreille, 1796. Precis. Caract. Gen. Ins., p. 128. No species.

Type-species: *Crabro lugubris* Fabricius. Desig. by Shuckard, 1837.

- Revision: Rohwer, 1917. Brooklyn Ent. Soc., Bul. 11: 97-102 (N. Amer. spp.).
- concolor** Say. Transcont. in Transit. Zone. Ecology: Nests in beetle borings in stump. Parasite: *Omalus janus* (Hald.), O. sp.; *Perithous mediator pleuralis* (Cr.); *Phalacrotophora longifrons* (Brues). Prey: *Longistigma caryae* (Harr.).
- Pemphredon concolor* Say, 1824. In Keating, Narr. Long's 2nd Exped., v. 2, p. 339.
- Pemphredon Morio* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 486. ♀. Preocc.
- Pemphredon concolor* Provancher, 1882. Nat. Canad. 13: 78. ♀. Preocc.
- Pemphredon Cressonii* Dalla Torre, 1897. Cat. Hym., v. 8, p. 359. N. name.
- Pemphredon Provancheri* Dalla Torre, 1897. Cat. Hym., v. 8, p. 359. N. name.
- Pemphredon shawii* Rohwer, 1917. Brooklyn Ent. Soc., Bul. 12: 100. ♂.
- Taxonomy: Evans, 1958. Amer. Ent. Soc., Trans. 84: 128-129, figs. 49-55 (larva).
- Biology: Reinhard, 1929. Nature Mag. 13: 154-157, 7 figs. (nest, prey, cocoon, life cycle, parasites). —Reinhard, 1929. The Witchery of Wasps, pp. 192-214, 3 pls. (nest, prey, cocoon, life cycle, parasites).
- confertim** Fox, Wash., Oreg., Calif. Ecology: Nests in oak gall and in borings in stems. Parasite: *Anthrax irroratus* Say; *Senotainia trilineata* (Wulp); *Omalus janus* (Hald.), O. *purpuratus* (Prov.); *Perithous mediator neomexicanus* (Vier.).
- Pemphredon confertim* Fox, 1892. Amer. Ent. Soc., Trans. 19: 311. ♂.
- Pemphredon errans* Rohwer, 1917. Brooklyn Ent. Soc., Bul. 12: 99. ♀, ♂.
- Biology: Parker and Bohart, 1966. Pan-Pacific Ent. 42: 94 (nest, parasites).
- foxii** Rohwer. Pa., N. J.
- Pemphredon foxii* Rohwer, 1917. Brooklyn Ent. Soc., Bul. 12: 101. ♀.
- montanus** Dahlbom. Transit. Zone east of Rocky Mts., B. C., N. W. T.; Europe.
- Pemphredon lugubris* var. *b.* Zetterstedt, 1838. Ins. Lapponica, p. 441.
- Pemphredon montanus* Dahlbom, 1844. Hym. Europaea, v. 1, p. 262. ♀, ♂.
- Pemphredon angularis* Fox, 1892. Amer. Ent. Soc., Trans. 19: 310. ♀, ♂.
- nearcticus** Kohl. Nev., Colo.
- Pemphredon (Cemonus) nearcticus* Kohl, 1890. K. K. Naturhist. Hofmus., Ann. 5: 55. ♀, ♂.
- Pemphredon cockerelli* Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 103. "♀" = ♂.
- rileyi** Fox. Calif. (Placer Co.).
- Pemphredon Rileyi* Fox, 1892. Amer. Ent. Soc., Trans. 19: 310. ♀ (♀ in part, ♂ misdet.).
- tinctipennis** Cameron. Ariz.
- Pemphredon tinctipennis* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 234. ♀.
- virginianus** Rohwer. N. Y., Pa., Va., W. Va., Wis. Ecology: Nests in rotten stump of tuliptree. Prey: *Cinara* sp.
- Pemphredon virginiana* Rohwer, 1917. Brooklyn Ent. Soc., Bul. 12: 101. ♀, ♂.

#### Genus PEMPHREDON Subgenus CEMONUS Panzer

- Cemonus* Jurine, 1801. Intell. Blatt. Litt. Ztg. Erlangen, v. 1, p. 164. Name suppressed by Internatl. Comn. Zool. Nomencl., Op. 135, 1939.
- Cemonus* Panzer, 1806. Krit. Rev. Insektenf. Deutschlands, v. 2, p. 186.
- Type-species: *Sphex unicolor* Panzer. Monotypic.
- Cemonus* Jurine, 1807. Nouv. Meth. Class., Hym. Dipt., p. 213. Preocc.
- Type-species: *Sphex unicolor* Panzer. Desig. by Shuckard, 1837.
- Dineurus* Westwood, 1837. Mag. Nat. Hist. (n. s.) 1: 173.
- Type-species: *Pemphredon unicolor* of Latreille. Orig. desig.
- Cenonus* Gimmerthal, 1836. Soc. Imp. Nat. Moscou 9: 436. Emend. or lapsus.
- Diphlebus* Westwood, 1840. Introd. Mod. Classif. Ins. 2. Gen. Synop., p. 81.
- Type-species: *Pelopoeus unicolor* Fabricius of Panzer. Orig. desig.
- Chevrieria* Kohl, 1883. Schweiz. Ent. Gesell., Mitt. 6: 658. Preocc.
- Type-species: *Pelopoeus unicolor* Fabricius of Panzer. Orig. desig.
- bipartior** Fox. N. Y. to Va., W. Va., Mo., Tex., N. W. T. Ecology: Nests in borings in twigs of sumac and elder. Parasite: *Omalus purpuratus* (Prov.)?; *Perithous mediator pleuralis* (Cr.)? Prey: *Eriosoma lanigerum* (Hausm.), *Rhopalosiphum rhois* Mon., Aphididae sp.
- Pemphredon bipartior* Fox, 1892. Amer. Ent. Soc., Trans. 19: 313. ♀.

- Pemphredon bipartitor* (!) Dalla Torre, 1897. Cat. Hym., v. 8, p. 356.  
*Pemphredon bipartitor* (!) Rau, 1928. Acad. Sci. St. Louis, Trans. 25: 369.  
*Pemphredon* (*Cereonus* (!)) *harbecki* Rohwer, 1910. Ent. News 21: 170. ♀.
- Biology:** Rau, 1928. Acad. Sci. St. Louis, Trans. 25: 369-373, figs. 46, 47 (nest, prey, life cycle).  
 —Rau, 1934. Canad. Ent. 66: 259 (nest, prey, life history). —Krombein, 1960. Ent. News 71: 34 (nest, prey).
- grinnelli** (Rohwer). B. C., Calif., Ariz., Utah, Colo. Ecology: Nests in borings in *Sambucus* stems. Parasite: *Anthrax irroratus* Say; *Omalus trilobatus* Boh. and Camp., *O. cressoni* (Aar.); *Eurytoma stigma* Ashm.; *Habrocytus analis* (Ashm.).  
*Ceratophorus gennelli* (!) Rohwer, 1910. Ent. Soc. Wash., Proc. 12: 104. ♀. This name was intended as a patronymic for F. Grinnelli, Jr., who collected the holotype.  
*Ceratophorus grinnelli utahensis* Rohwer, 1911. U. S. Natl. Mus., Proc. 40: 562. ♀.  
*Cemonus giffardi* Rohwer, 1917. U. S. Natl. Mus., Proc. 53: 246. ♀.
- Taxonomy:** Evans, 1958. Amer. Ent. Soc., Trans. 84: 129, fig. 57 (larva).
- Biology:** Parker and Bohart, 1966. Pan-Pacific Ent. 42: 94 (nest, parasites).
- inornatus** Say. Transcont. in Transit. and U. Austr. Zones; Europe. Ecology: Nests in cavities in twigs, in rotten wood, and in exposed tree roots. Parasite: *Perithous mediator pleuralis* Cr. Prey: *Macrosiphum* sp.  
*Pemphredon inornatus* Say, 1824. In Keating, Narr. Long's 2nd Exped., v. 2, p. 339.  
*Cemonus Shuckardi* Morawitz, 1864. Acad. Imp. des Sci. St. Petersburg, Bul. 7: 460. ♀, ♂.  
*Cemonus dentatus* Puton, 1871. Soc. Ent. de France, Ann. (5) 1: 94. ♀.  
*Pemphredon tenax* Fox, 1892. Amer. Ent. Soc., Trans. 19: 313. ♀, ♂.
- Taxonomy:** Evans, 1958. Amer. Ent. Soc., Trans. 84: 128-129, figs. 49-55 (larva).
- Biology:** Rau and Rau, 1918. Wasp Studies Afield, p. 108 (nest, prey, life cycle). —Rau, 1928. Acad. Sci. St. Louis, Trans. 25: 373-375 (nest, prey). —Rau, 1946. Brooklyn Ent. Soc., Bul. 41: 10. —Evans, 1958. Amer. Ent. Soc., Trans. 84: 129 (nest).
- lethifer** (Shuckard). Ont. south to Fla., Pa. west to Ill., Colo., Utah, Wash., Calif.; Europe.  
 Ecology: Nests in North America in soft pith of roses, berries, sumac, hibiscus. Possibly adventive in North America. Parasite: *Perithous divinator* (Rossi); *Omalus auratus* (L.), *O. purpuratus* (Prov.). Prey: *Aphis gossypii* Glov., A. sp. nymphs, *Chaitophorus populicola patchae* H. R. L. nymphs and adults.  
*Cemonus lethifer* Shuckard, 1837. Essay on Indig. Fossor. Hym., p. 201. ♀, ♂.  
*Cemonus strigatus* Chevrier, 1870. Schweiz. Ent. Gesell., Mitt. 3: 269. ♀, ♂.  
*Cemonus Fabricii* Mueller, 1911. Ent. Rundschau 28: 107. N. name for *unicolor* Auctt.  
*Pemphredon* (*Diphlebus*) *littoralis* Wagner, 1918. Deut. Ent. Ztschr., p. 143. ♀, ♂.  
*Pemphredon* (*Diphlebus*) *fuscatus* Wagner, 1918. Deut. Ent. Ztschr., p. 143. ♂.  
*Pemphredon* (*Diphlebus*) *neglectus* Wagner, 1918. Deut. Ent. Ztschr., p. 143. ♂.  
*Pemphredon* (*Diphlebus*) *minutus* Wagner, 1918. Deut. Ent. Ztschr., p. 143. ♂.  
*Pemphredon* (*Dineurus*) *lethifer* form *confusa* Wagner, 1932 (1931). Deut. Ent. Ztschr., p. 231. ♀.  
*Pemphredon* (*Dineurus*) *brevipetiolatus* Wagner, 1932 (1931). Deut. Ent. Ztschr., p. 232, fig. 14. ♂.
- Taxonomy:** Krombein, 1959. Brooklyn Ent. Soc., Bul. 54: 95-96 (occurrence of *lethifer* in N. Amer. and differentiation from N. Amer. spp.). —Evans, 1964. Amer. Ent. Soc., Trans. 90: 246-248, figs. 23-25 (larva).
- Biology:** Rau, 1948. Ent. Soc. Amer., Ann. 41: 326 (nest, prey; misdet. as *inornatus*).  
 —Krombein, 1959. Brooklyn Ent. Soc., Bul. 54: 96 (parasite). —Krombein, 1960. Ent. News 71: 34-35 (nest, prey, cocoon, life cycle, parasite). —Krombein, 1964. Biol. Soc. Wash., Proc. 77: 99-100, fig. 17 (nest, prey, life cycle). —Thomas, 1964. Mich. Acad. Sci., Arts and Letters, Papers 49: 199-201 (nest, parasite, life history). —Parker and Bohart, 1966. Pan-Pacific Ent. 42: 94 (nest).

## Genus PASSALOECUS Shuckard

*Xyloecus* Shuckard, 1837. Essay Indig. Fossor. Hym., Conspect. Gen., No. 25. Preocc.



*Passaloecus* Shuckard, 1837. Essay Indig. Fossor. Hym., p. 188. N. name.

Type-species: *Pemphredon insignis* Vander Linden. Orig. desig.

*Coelocetus* Verhoeff, 1890. Ent. Nachr. 16: 383.

Type-species: *Diodontus gracilis* Curtis. Desig. by Pate, 1937.

*Heroecus* Verhoeff, 1890. Ent. Nachr. 16: 383. No species.

Type-species: *Pemphredon insignis* Vander Linden. Included and desig. by Pate, 1937.

Most *Passaloecus* nest in pre-existing borings, cavities in wood or twigs and stems, in decaying wood and in abandoned galls, although one extralimital species has been recorded as nesting in sandy soil. Two North American species, *annulatus* and *cuspidatus*, and the Holarctic *insignis*, have been reported in North America as making a series of linear cells with the partitions and closing plugs made from resin. The Peckhams' report (1905) of *annulatus* closing its nest with pellets of mud is questionable and may have been based on a misidentification. However, two species in Europe and Japan are known to form the cell partitions from grains of earth, insect feces and other debris, so perhaps *annulatus* is not so restricted in its choice of nesting materials as *cuspidatus* and *insignis*. Aphids are the preferred prey, but rarely, and perhaps inadvertently, a few psyllids may be included in a cell.

Taxonomy: Krombein, 1938. Brooklyn Ent. Soc., Bul. 33: 122-127 (key to N. Y. spp.).

**annulatus annulatus** (Say), n. status. Ont., transcont. in U. S. Ecology: Nests in deserted beetle burrows in wood or pith, and in logs. Prey: *Drepanaphis acerifoliae* (Thos.) ? nymph, *D. sp. nymph*, *Macrosiphum sp. nymph*, *Neothomasia populicola* (Thos.), Aphididae sp. Another subsp. occurs in Korea.

*Pemphredon annulatus* Say, 1837. Boston Jour. Nat. Hist. 1: 379. ♀, ♂.

*Passalacetus* (!) *rivertonensis* Viereck, 1904. Amer. Ent. Soc., Trans. 30: 243. ♂.

*Passalacetus* (!) *equalis* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 212. ♀.

Biology: Peckham and Peckham, 1905. Wasps, Social and Solitary, pp. 87-89 (nest, prey, life cycle). —Krombein, 1955. Brooklyn Ent. Soc., Bul. 50: 16 (prey). —Krombein, 1958. Biol. Soc. Wash., Proc. 71: 24 (nest, prey). —Krombein, 1960. Ent. News 71: 35-36 (nest, prey). —Krombein, 1961. Brooklyn Ent. Soc., Bul. 56: 65 (nest, prey).

**armeniaca** Cockerell. N. Mex., Ariz., Colo., Idaho, Calif., B. C.

*Passaloecus armeniaca* Cockerell, 1897. In Cockerell and Fox, Acad. Nat. Sci. Phila., Proc. 49: 141. ♀.

**borealis** Dahlbom. Alaska, western Canada, Rocky Mts. south to Utah, Colo.; north. Europe and at higher altitudes in south.

*Passaloecus borealis* Dahlbom, 1844. Hym. Europaea, v. 1, p. 247. ♀, ♂.

**cuspidatus** Smith. Transcont. chiefly in Transit. and U. Austr. Zones. Ecology: Nests in borings in wood, and provisions each cell with 11-52 aphids. Parasite: *Anthrax irroratus* Say; *Poemenia a. americana* (Cr.), *P. a. nebulosa* Hab. and Tow.; Chalcididae sp.; *Omalus aeneus* (F.), *O. purpuratus* (Prov.), *O. cressoni* (Aar.). Prey: *Cinara abieticola* (Chol.), *C. formacula* Hottes, *Pterocomma bicolor* (Oest.), *Macrosiphum euphorbiae* (Thos.), *M. rosae* (L.), *M. spp.*, *Myzus porosus* (Sand.), *Masonaphis sp.*, *Rhopalosiphum sp.*, *Euceraphis betulae* (Koch). Predator: *Philaenus pulcher* D. T., *P. pacificus* Cr.

*Passaloecus cuspidatus* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 427. ♀.

*Pemphredon mandibularis* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 487. ♀.

*Passaloecus distinctus* Fox, 1892. Amer. Ent. Soc., Trans. 19: 319.

*Passaloecus dispar* Fox, 1892. Amer. Ent. Soc., Trans. 19: 320. ♂.

Taxonomy: Evans, 1958. Amer. Ent. Soc., Trans. 84: 131-132, figs. 60-64 (larva). —Evans, 1959. Amer. Ent. Soc., Trans. 85: 167 (larva). —Evans, 1964. Amer. Ent. Soc., Trans. 90: 250-251 (larva).

Biology: Packard, 1869. Guide Study Ins., p. 161 (nest, prey, parasite). —Krombein, 1956. Brooklyn Ent. Soc., Bul. 51: 42-43 (nest, prey). —Krombein, 1958. Biol. Soc. Wash., Proc. 71: 24-25 (nest, prey). —Fye, 1965. Canad. Ent. 97: 740, 742 (nest, prey, parasite, life cycle). —Krombein, 1967. Trap-nesting wasps and bees, pp. 236-239, figs. 66, 67 (nest, prey, life cycle, parasites). —Evans, 1973. Great Basin Nat. 33: 154-155 (nest, prey, parasites, predators).

- gracilis** (Curtis). Pa. and N. J. to Tex. along coast, Ohio, Ind., Mich.; west. Europe. Ecology: Nests in borings in twigs. Adventive from Europe. Parasite: *Perithous divinator* (Rossi); *Omalus auratus* (L.).  
*Diodontus gracilis* Curtis, 1834. Brit. Ent., v. 11, pl. 496. ♂.  
*Passaloecus turionum* Dahlbom, 1844. Hym. Eur. 1: 246. ♀, ♂.  
*Passaloecus brevicornis* Morawitz, 1864. Acad. Sci. St. Petersburg, Bul. 7: 462. ♀, ♂.
- Taxonomy: Krombein, 1961. Ent. News 72: 258-259 (adventive in U. S. and separation from N. Amer. spp.).
- Biology: Krombein, 1961. Ent. News 72: 258 (nest, parasite).
- marginatus** (Say). Pa.  
*Pemphredon marginatus* Say, 1837. Boston Jour. Nat. Hist. 1: 379.
- melanocrus** Rohwer. Tex., Colo., Ariz. Ecology: Nests in abandoned burrows of *Dendroctonus barberi* Hopkins.  
*Passaloecus melanocrus* Rohwer, 1911. U. S. Natl. Mus., Proc. 40: 561. ♂.
- melanognathus** Rohwer. Oreg., Calif.  
*Passaloecus melanognathus* Rohwer, 1910. Ent. Soc. Wash., Proc. 12: 104. ♀.
- monilicornis ithacae** Krombein, n. status (D. Vincent). Mass., Conn., N. Y., Va., Ont., Mich., Minn., Alta., Alaska. Ecology: Nests in borings in twigs and wood. Parasite: *Omalus aeneus* (F.), *O. sp.*; *Poemenia albipes* (Cr.), *P. sp.* Prey: *Cinara hottesi* (Gill. and Palm.), *C. abieticola* (Chol.), *C. fornacula* Hottes, *C. palmerae* (Gill.), *C. braggii* (Gill.), *C. sp.*, *Neosymdobioides americanus* (Baker), *Pterocomma smithiae* Mon. ?, *Amphorophora* sp., *Anuraphis rosea* Baker, *Rhopalosiphum fitchii* (Sand.), *Euceraphis betulae* (Koch). Typical *monilicornis* Dahlbom occurs in the Palaearctic Region.  
*Passaloecus ithacae* Krombein, 1938. Brooklyn Ent. Soc., Bul. 33: 126. ♀, ♂.
- Taxonomy: Evans, 1964. Amer. Ent. Soc., Trans. 90: 249-250, fig. 22 (larva).
- Biology: Fye, 1965. Canad. Ent. 97: 737-740, fig. 9 (nest, prey, parasites, life cycle).  
—Krombein, 1967. Trap-nesting wasps and bees, pp. 234-236 (nest, prey, life cycle).
- relativus** Fox. Wyo., Colo., Utah, Nev., Ariz. Parasite: *Poemenia americana nebulosa* Hab. and Tow. Predator: *Philanthus pulcher* D. T., *P. pacificus* Cr.  
*Passaloecus relativus* Fox, 1892. Amer. Ent. Soc., Trans. 19: 319. ♂.
- Taxonomy: Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 100. ♀.
- singularis singularis** Dahlbom. Mass., N. Y., Pa., Ohio, Mich., Utah, Colo.; Europe. Ecology: Nests in abandoned burrows of *Pissodes strobi* (Peck). Possibly adventive in N. Amer.  
Another subsp. occurs in Mongolia.  
*Passaloecus singularis* Dahlbom, 1844. Hym. Europaea, v. 1, p. 243. ♂.  
*Passaloecus tenuis* Morawitz, 1864. Acad. Imp. des Sci. St. Petersburg, Bul. 7: 462. ♀, ♂.  
*Passaloecus gertrudis* Krombein, 1938. Brooklyn Ent. Soc., Bul. 33: 124. ♀, ♂.

#### Genus POLEMISTUS Saussure

- Polemistus* Saussure, 1892. In Grandidier, Hist. Nat. Madagascar, v. 20, p. 565.  
Type-species: *Polemistus macilentus* Saussure. Desig. by Pate, 1937.
- Polymistus* Ashmead, 1899. Canad. Ent. 31: 222. Emend. or lapsus.
- pusillus** Saussure. Utah, Ariz.; Mexico. Ecology: Nests in abandoned *Trypargilum* mud nests and makes cell partitions and nest closure from a transparent glass-like substance (resin ?), and stores 6-8 aphids per cell. Parasite: *Monodontomerus* sp.; *Omalus* sp., *Chrysis* sp. Prey: *Aphis gossypii* Glov., *A. sp.*, *Macrosiphum* sp.  
*Polemistus pusillus* Saussure, 1892. In Grandidier, Hist. Nat. Madagascar, v. 20, p. 565. ♀.
- Biology: Rau, 1943. Ent. Soc. Amer., Ann. 36: 647 (nest, prey, parasites).

#### TRIBE STIGMINI

#### Genus STIGMUS Panzer

- Taxonomy: Krombein, 1973. Biol. Soc. Wash., Proc. 86: 211-230, 16 figs. (synonymy, distribution and key to N. Amer. spp.).

## Genus STIGMUS Subgenus STIGMUS Panzer

*Stigmus* Panzer, 1804. Faunae Ins. German., heft 86, No. 7.

Type-species: *Stigmus pendulus* Panzer. Monotypic.

*Gonostigmus* Rohwer, 1911. U. S. Natl. Mus., Proc. 40: 559.

Type-species: *Gonostigmus typicus* Rohwer. Orig. desig.

Most species nest in pre-existing cavities, often beetle borings, in twigs, wood, structural timber, shelf fungi and galls, but some tunnel in soft pith. The cells are usually placed in a linear series except when old galls are used.

So far as known, only aphids are preyed upon.

**americanus** Packard. Transcont. in Canada from Labrador and N. S. to B. C. and N. W. T., in U. S. east of 100th meridian and Wash. Ecology: Nests most commonly in old beetle borings in dead trees or structural timber, occasionally in twigs; cells in a linear series are separated by partitions of wood or pith particles, but there is an authentic record of two wasps developing in a single brood chamber. Parasite: *Omalus janus* (Hald.), *O. iridescens* (Nort.), *O. purpuratus* (Prov.). Prey: *Drepanaphis acerifoliae* (Thos.) nymphs, *D. sp.* nymphs and adult, *Rhopalosiphum sp.* nymphs, *Aphis sp.* nymph, *Anuraphis sp.* nymphs, *Myzocallis ? sp.* nymph, *Chaitophorus ? sp.* nymph, *Therioaphis sp.* nymphs and adults, Aphidini sp., Panaphidini sp. nymphs and adult, Aphidinae sp. nymph.

*Stigmus americanus* Packard, 1867. Ent. Soc. Phila., Proc. 6: 386. ♀, ♂.

*Stigmus lucidus* Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 102. ♂.

*Stigmus fraternus coloradensis* Rohwer, 1911. U. S. Natl. Mus., Proc. 40: 559. ♀.

Biology: Peckham and Peckham, 1898. Wis. Geol. Nat. Hist. Survey, Bul. 2: 44-45 (nest, prey, parasite). — Krombein, 1954. Brooklyn Ent. Soc., Bul. 49: 6 (nest, prey). — Krombein, 1955. Brooklyn Ent. Soc., Bul. 50: 16 (nest, prey). — Krombein, 1956. Brooklyn Ent. Soc., Bul. 51: 42. (prey). — Krombein, 1958. Biol. Soc. Wash., Proc. 71: 24 (nest, prey). — Krombein, 1961. Brooklyn Ent. Soc., Bul. 56: 64-65 (nest, prey, life cycle).

**aphidiperda** Rohwer. Pa. to N. C. Ecology: Nests in peach twig. Prey: *Aphis persicaeniger* Sm.

*Stigmus aphidiperda* Rohwer, 1911. U. S. Natl. Mus., Proc. 40: 558. ♀, ♂.

**fraternus** Say. Mass. and N. H. to S. C., W. Va., Tenn., Mo. Ecology: Nests in twigs, old galls and beetle borings in structural timber. Prey: *Monellia sp.* nymphs, *Therioaphis sp.* nymphs, Aphididae spp.

*Stigmus fraternus* Say, 1824. In Keating, Narr. Long's 2nd Exped., v. 2, p. 340.

*Stigmus conestogorum* Rohwer, 1911. U. S. Natl. Mus., Proc. 40: 557. ♀.

*Stigmus fraternus rauli* Rohwer, 1923. Ent. Soc. Wash., Proc. 25: 100. ♀, ♂.

Biology: Packard, 1869. Guide Study Ins., p. 161 (nest). — Rau, 1928. Acad. Sci. St. Louis, Trans. 25: 379-381 (nest, prey, life cycle). — Krombein, 1958. Biol. Soc. Wash., Proc. 71: 24 (nest, prey).

**fulvicornis** Rohwer. Miss. (Starksville). Ecology: Nesting in floors of porch and in house. Prey: Aphididae sp.

*Stigmus fulvicornis* Rohwer, 1923. Wash. Acad. Sci., Jour. 13: 370. ♀.

Biology: Smith, 1923. Jour. Econ. Ent. 16: 553-554 (nest, prey).

**hubbardi** Rohwer. Colo., Utah, N. Mex., Ariz., Calif., Wash. Ecology: Nests in the shelf fungus *Polyporus*.

*Stigmus inordinatus hubbardi* Rohwer, 1911. U. S. Natl. Mus., Proc. 40: 559. ♀, ♂.

Biology: Rohwer, 1911. U. S. Natl. Mus., Proc. 40: 559 (nest).

**inordinatus inordinatus** Fox. Mont., Colo. and N. Mex. west to B. C. and Calif. Ecology: Nests in cavities or borings in twigs or stems of mulberry, peony, peach, raspberry and elderberry, constructing a linear series of cells stored with 12-30 aphids per cell. Parasite: *Omalus variatus* (Aar.), *O. glomeratus* (Buyss.), *O. cressoni* (Aar.). Prey: *Aphis frangulae* Kalt. ?, Aphididae sp.

*Stigmus inordinatus* Fox, 1892. Amer. Ent. Soc., Trans. 19: 322. ♀, ♂.

*Stigmus fulvipes* var. *coquilletti* Rohwer, 1911. U. S. Natl. Mus., Proc. 40: 559. ♀, ♂.

*Stigmus reticulatus* Mickel, 1918 (1917). Nebr. Univ., Studies 17: 330. ♀.

Taxonomy: Evans, 1958. Amer. Ent. Soc., Trans. 84: 134-135, figs. 68, 69 (larva).

Biology: Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 102 (prey). — Wasbauer and Simonds, 1964. Pan-Pacific Ent. 40: 114-116, 1 fig. (nest, prey, cocoon). — Parker and Bohart, 1966. Pan-Pacific Ent. 42: 95 (nest, parasites).

*inordinatus universitatis* Rohwer. Conn. to Va., W. Va., Ill., Colo. Ecology: Nests in old insect galls on oak. Prey: Aphididae sp.

*Stigmus inordinatus universitatis* Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 102. ♀.

Biology: Richardson, 1915. Psyche 22: 104-105 (nest, prey). — Krombein, 1973. Biol. Soc. Wash., Proc. 86: 224 (nest).

*podagricus podagricus* Kohl. South. Tex. and Ariz.; Mexico (Veracruz, Morelos).

*Stigmus podagricus* Kohl, 1890. K. K. Naturhist. Hofmus., Ann. 5: 65. ♂.

*podagricus tarsalis* Krombein. Ga., Fla., Ala., centr. and north. Tex.

*Stigmus (Stigmus) podagricus tarsalis* Krombein, 1973. Biol. Soc. Wash., Proc. 86: 225, figs. 6, 16. ♂, ♀.

### Genus STIGMUS Subgenus ATOPOSTIGMUS Krombein

*Stigmus* subg. *Atopostigmus* Krombein, 1973. Biol. Soc. Wash., Proc. 86: 218.

Type-species: *Stigmus fulvipes* Fox. Orig. desig.

The single known species apparently nests in abandoned burrows of other insects in the soil. The preferred prey is unknown.

*fulvipes* Fox. B. C. transcont. in U. S.; Mexico (Morelos). Ecology: Nests in sand or mud banks in abandoned burrows of other insects.

*Stigmus fulvipes* Fox, 1892. Amer. Ent. Soc., Trans. 19: 324. ♀.

Taxonomy: Krombein, 1952. Amer. Ent. Soc., Trans. 78: 94 (separation from eastern spp.).

Biology: Krombein, 1973. Biol. Soc. Wash., Proc. 86: 218 (nesting site).

### NOMEN NUDUM IN STIGMUS PANZER

*coloradensis* Ashmead. Colo.

*Stigmus coloradensis* Ashmead, 1889. In Cockerell, Colo. Biol. Assn., 10th Rept., p. 2.

Probably published originally in Custer County Courant newspaper.

### Genus SPILOMENA Shuckard

*Celia* Shuckard, 1837. Essay Indig. Fossor. Hym., p. 182. Preocc.

Type-species: *Stigmus troglodytes* Vander Linden. Monotypic.

*Spilomena* Shuckard, 1838. Ent. Soc. London, Trans. 2: 79 (footnote). N. name.

*Microglossa* Rayment, 1930. Roy. Soc. Victoria, Proc. (n. s.) 42: 212. Preocc.

Type-species: *Microglossa longifrons* Rayment. Orig. desig.

*Microglossella* Rayment, 1935. A Cluster of Bees, p. 634. N. name.

*Taialia* Tsuneki, 1971. Life Study (Fukui) 15: 10.

Type-species: *Taialia formosana* Tsuneki. Orig. desig.

Biological notes have been recorded for only three North American species. All of them nest in abandoned borings of anobiid beetles in structural timber or logs. They prey upon Thysanoptera, usually immatures although occasionally adults are captured. Some extralimital species nest in twigs or decayed wood; in addition to Thysanoptera these species also prey upon immature Psyllidae, Coccidae and Aphididae. About a dozen undescribed species occur in the southwestern deserts.

Taxonomy: Krombein, 1958. Ent. Soc. Wash., Proc. 60: 54, 60-61, figs. 2-6 (key to eastern spp.).

*alboclypeata* Bradley. B. C., Oreg., Calif., Idaho, Mont., Utah, Ariz., N. Mex., Colo., Kans., W. Va., Va. Ecology: Nests in abandoned borings of anobiid beetles. Prey: Immature Thysanoptera.

*Spilomena alboclypeata* Bradley, 1906. Canad. Ent. 38: 380. ♂.

Taxonomy: Krombein, 1958. Ent. Soc. Wash., Proc. 60: 60, figs. 4, 4a, 6. ♀, ♂.

Biology: Krombein, 1958. Ent. Soc. Wash., Proc. 60: 62 (prey, nest).

**ampleps** Krombein. W. Va. (Lost River St. Pk.). Ecology: Presumably nests in old beetle borings in logs.

*Spilomena ampleps* Krombein, 1952. Ent. Soc. Wash., Proc. 54: 178, figs. 1-3. ♂, ♀.

Taxonomy: Krombein, 1958. Ent. Soc. Wash., Proc. 60: 60, figs. 3, 3a. ♀, ♂.

**barberi** Krombein. Mass., N. Y. and Ont. south to Ga. and Tenn., Iowa, Kans., Colo., N. Mex., Ariz., Utah, Calif. Ecology: Nests in abandoned anobiid borings in wood. Prey: *Sericothrips* sp. larva, *Frankliniella* or *Thrips* sp. larva, Thripidae sp. larva.

*Spilomena barberi* Krombein, 1962. Biol. Soc. Wash., Proc. 75: 12. ♂, ♀.

**foxii** Cockerell. Colo., N. Mex., Ariz., Calif., Wash.; Mexico (Baja California, Puebla).

*Spilomena foxii* Cockerell, 1897. Entomologist 30: 136. ♀.

**pusilla** (Say). Conn. to N. C., west to Iowa, Kans. and Tenn. Ecology: Nests in abandoned anobiid burrows in structural timber and in logs. Prey: *Sericothrips* sp. larva in *variabilis* (Beach) section, Thripidae spp. larvae and adult.

*Stigmus pusillus* Say, 1837. Boston Jour. Nat. Hist. 1: 378. ♀, ♂.

Taxonomy: Krombein, 1952. Ent. Soc. Wash., Proc. 54: 178-179, figs. 4-6. ♀, ♂. —Krombein, 1958. Ent. Soc. Wash., Proc. 60: 53, 61, figs. 2, 2a, 5. ♀, ♂.

Biology: Krombein, 1952. Ent. Soc. Wash., Proc. 54: 181 (nest). —Krombein, 1956. Ent. Soc. Wash., Proc. 58: 155 (nest, prey). —Krombein, 1958. Ent. Soc. Wash., Proc. 60: 53 (nest, prey).

### Genus XYSMA Pate

*Xysma* Pate, 1937. Amer. Ent. Soc., Trans. 63: 94.

Type-species: *Ammoplanus ceanothae* Viereck. Orig. desig.

*Telexysma* Leclercq, 1959. Parc Natl. Upemba, I. Mission G. Witte, fasc. 53 (2), p. 2.

Type-species: *Telexysma africana* Leclercq. Orig. desig.

The North American *ceanothae* nests in abandoned anobiid borings in structural timber and preys upon immature Thysanoptera. Nothing is known of the biology of the only other *Xysma*, the South African *africana*.

**ceanothae** (Viereck). Pa., Md., D. C., Va., Ga. Ecology: Nests in abandoned anobiid borings in structural timber. Prey: Thripinae spp. larvae.

*Ammoplanus ceanothae* Viereck, 1904. Psyche 11: 72. ♀ (♀ in part, ♂, misdet.).

Taxonomy: Krombein, 1958. Biol. Soc. Wash., Proc. 71: 25. ♂.

Biology: Krombein, 1958. Biol. Soc. Wash., Proc. 71: 25 (nest, prey).

### TRIBE AMMOPLANINI

#### Genus PULVERRO Pate

*Pulverro* Pate, 1937. Amer. Ent. Soc., Trans. 63: 107.

Type-species: *Pulverro mescalero* Pate. Orig. desig.

This genus has been recorded only from the Nearctic Region. One species has been recorded as nesting in soil and preying upon Thysanoptera, mostly adults but a few immatures.

Revision: Pate, 1937. Amer. Ent. Soc., Trans. 63: 107-119, figs. 4, 6, 7, 9-12, 16, 20.

**californicus** Eighme. Calif. in North Coast Ranges.

*Pulverro californica* Eighme, 1973. Pan-Pacific Ent. 49: 49. ♂, ♀.

**chumashano** Pate. West. Calif.

*Pulverro chumashano* Pate, 1937. Amer. Ent. Soc., Trans. 63: 118. ♂.

*Pulverro costano* Pate, 1937. Amer. Ent. Soc., Trans. 63: 116. ♀.

Taxonomy: Pate, 1939. Amer. Ent. Soc., Trans. 64: 417, fig. 24 (female *chumashano*).

**columbianus** (Kohl). Colo., Utah, Idaho, Oreg., B. C.

*Ammoplanus* (?) *columbianus* Kohl, 1890. K. K. Naturhist. Hofmus., Ann. 5: 61. "♀" = ♂.

*Ammoplanus eriogoni* Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 101. ♂.

*Pulverro colorado* Pate, 1937. Amer. Ent. Soc., Trans. 63: 115. ♀.

*constrictus* (Provancher). South. Calif.

*Anacrabro constrictus* Provancher, 1895. Nat. Canad. 22: 141. ♀.

*Pulverro serrano* Pate, 1937. Amer. Ent. Soc., Trans. 63: 114, fig. 9. ♂.

Taxonomy: Pate, 1939. Amer. Ent. Soc., Trans. 64: 413, fig. 6 (female *serrano*).

*laevis* (Provancher). Calif. (Los Angeles).

*Anacrabro laevis* Provancher, 1895. Nat. Canad. 32: 142. ♀.

*mescalero* Pate. Tex., N. Mex., Ariz.; n. and cent. Mexico.

*Ammoplanus mandibularis* Ashmead, 1898. In Cockerell, Davenport Acad. Nat. Sci., Proc. 7: 148. Nom. nud.

*Pulverro mescalero* Pate, 1937. Amer. Ent. Soc., Trans. 63: 111. ♀, ♂.

Taxonomy: Pate, 1939. Amer. Ent. Soc., Trans. 64: 411.

*monticola* Eighme. Calif. in North Coast Ranges. Ecology: Nests in sloping banks, constructs several cells off side burrows, and provisions each with up to 21 thrips. Prey:

*Frankliniella moultoni* Hood, *Aeolothrips fasciatus* (L.); mostly adults and some larvae. *Pulverro monticola* Eighme, 1968. Pan-Pacific Ent. 44: 263, figs. 1-7. ♂, ♀.

Taxonomy: Bohart and Grissell, 1972. Pan-Pacific Ent. 48: 148-149, figs. 1-4 (larva).

Biology: Bohart and Grissell, 1972. Pan-Pacific Ent. 48: 145-148, fig. 5 (nest, prey, life cycle).

### Genus AMMOPLANOPS Gussakovskij

*Ammoplanops* Gussakovskij, 1931. Soc. Espan. Hist. Nat., Bol. 31: 457.

Type-species: *Ammoplanops carinatus* Gussakovskij. Orig. desig.

Nothing is known of the nesting habits or prey. The presence of a tarsal pecten and pygidium in the female suggests that the species are ground-nesting.

Revision: Pate, 1939. Amer. Ent. Soc., Trans. 64: 392-411, figs. 3, 10-12, 17-23, 25.

*ashmeadi* Pate. Calif. (Palm Springs).

*Ammoplanops ashmeadi* Pate, 1939. Amer. Ent. Soc., Trans. 64: 397. ♀, ♂.

*cockerelli* (Ashmead). Tex., N. Mex., Colo., Utah, Ariz., Calif.

*Ammoplanus cockerelli* Ashmead, 1903. Ent. News 14: 295. ♀.

*cressoni* Pate. Ariz., Nev., Calif.

*Ammoplanops cressoni* Pate, 1939. Amer. Ent. Soc., Trans. 64: 395. ♂.

*foxi* Pate. Calif. (Clark Mt. in San Bernardino Co.).

*Ammoplanops foxi* Pate, 1939. Amer. Ent. Soc., Trans. 64: 409. ♂.

*moenkopi* Pate. N. Mex., Ariz., Utah.

*Ammoplanops moenkopi* Pate, 1939. Amer. Ent. Soc., Trans. 64: 402. ♂.

*timberlakei* Pate. Calif. (Andreas Canyon in Riverside Co.).

*Ammoplanops timberlakei* Pate, 1939. Amer. Ent. Soc., Trans. 64: 404. ♂.

*vierecki* Pate. N. Mex. (Alamogordo).

*Ammoplanops vierecki* Pate, 1939. Amer. Ent. Soc., Trans. 64: 406. ♀, ♂.

### Genus AMMOPLANUS Giraud

*Ammoplanus* Giraud, 1869. Soc. Ent. France, Ann. (4) 9: 469.

Type-species: *Ammoplanus Perrisi* Giraud. Desig. by Pate, 1937.

*Hoplocrabron* De Stefani, 1886. Nat. Sicil. 6: 60.

Type-species: *Hoplocrabron Marathroicus* De Stefani. Monotypic.

*Ammoplanus* subg. *Ceballosia* Giner Mari, 1943. Eos 19: 293. Preocc.

Type-species: *Ammoplanus rjabovi* Gussakovskij. Orig. desig.

Nothing is known definitely as to the ethology of our species. In Europe and Africa species of this genus nest in pre-existing cracks in stone, wood or soil and provision the cells with immature Thysanoptera.

Revision: Pate, 1943 (1942). South. Calif. Acad. Sci., Bul. 41: 144-157, figs. 1, 5, 6, 8-12 (N.

Amer. spp.).

**chemehuevi** Pate. Calif. (Riverside Co.).

*Ammoplanus (Ammoplanus) chemehuevi* Pate, 1943 (1942). South. Calif. Acad. Sci., Bul. 41: 151. ♀, ♂.

**loti** Pate. Calif. (Riverside).

*Ammoplanus (Ammoplanus) loti* Pate, 1943 (1942). South. Calif. Acad. Sci., Bul. 41: 146. ♀.

**quabajai** Pate. Calif.

*Ammoplanus (Ammoplanus) quabajai* Pate, 1943 (1942). South. Calif. Acad. Sci., Bul. 41: 156. ♀.

**sechi** Pate. Calif. (Riverside Co.).

*Ammoplanus (Ammoplanus) sechi* Pate, 1943 (1942). South. Calif. Acad. Sci., Bul. 41: 149. ♂.

**tetli** Pate. Calif. (Tetly Park, San Bernardino Mts.).

*Ammoplanus (Ammoplanus) tetli* Pate, 1943 (1942). South. Calif. Acad. Sci., Bul. 41: 147. ♂.

**unami** Pate. Pa., W. Va. Ecology: Presumably nests in abandoned beetle borings in logs.

*Ammoplanus (Ammoplanus) unami* Pate, 1937. Amer. Ent. Soc., Trans. 63: 101. ♀.

Taxonomy: Krombein, 1956. Ent. Soc. Wash., Proc. 58: 159, figs. 2, 2a (male).

Biology: Krombein, 1956. Ent. Soc. Wash., Proc. 58: 160 (putative nest site).

**vanyumi** Pate. Calif., Idaho.

*Ammoplanus (Ammoplanus) vanyumi* Pate, 1943 (1942). South. Calif. Acad. Sci., Bul. 41: 154. ♀.

#### Genus AMMOPLANELLUS Gussakovskij

Revision: Pate, 1943 (1942). South. Calif. Acad. Sci., Bul. 41: 158-162, figs. 2-4, 7 (N. Amer. spp.).

#### Genus AMMOPLANELLUS Subgenus AMMOPLANELLUS Gussakovskij

*Ammoplanus* subg. *Ammoplanellus* Gussakovskij, 1931. Soc. Espan. Hist. Nat., Bol. 31: 442.

Type-species: *Ammoplanus (Ammoplanellus) chorasmius* Gussakovskij. Orig. desig.

The species are thought to nest in pre-existing holes or crannies in wood, and possibly to provision the cells with Thysanoptera.

**umatilla** (Pate). Wash.

*Ammoplanus (Ammoplanellus) umatilla* Pate, 1945. Pan-Pacific Ent. 21: 82. ♀.

**xila** (Pate). Ariz. (Phoenix). Ecology: Possibly nesting in chair containing burrows of

*Hesperorhipis mirabilis* Knull.

*Ammoplanus (Ammoplanellus) xila* Pate, 1945. Pan-Pacific Ent. 21: 84. ♀.

#### Genus AMMOPLANELLUS Subgenus PARAMMOPLANUS Pate

*Ammoplanus* subg. *Parammoplanus* Pate, 1939. Amer. Ent. Soc., Trans. 64: 391.

Type-species: *Ammoplanus (Ammoplanellus) apache* Pate. Orig. desig.

**apache** (Pate). N. Mex., Ariz., Calif.

*Ammoplanus (Ammoplanellus) apache* Pate, 1937. Amer. Ent. Soc., Trans. 63: 106. ♂.

**lenape lenape** (Pate). Pa. (Lehigh Gap).

*Ammoplanus (Ammoplanellus) lenape* Pate, 1937. Amer. Ent. Soc., Trans. 63: 104. ♂.

**lenape olamentke** (Pate). Calif., Mont.

*Ammoplanus (Parammoplanus) lenape olamentke* Pate, 1943 (1942). South. Calif. Acad. Sci., Bul. 41: 160. ♀, ♂.

#### Genus TIMBERLAKENA Pate

*Timberlakena* subg. *Riparena* Pate, 1939. Amer. Ent. Soc., Trans. 64: 378.

- Type-species: *Timberlakena (Riparena) cahuilla* Pate. Orig. desig.  
*Timberlakena* subg. *Mojavena* Pate, 1939. Amer. Ent. Soc., Trans. 64: 381.  
 Type-species: *Timberlakena (Mojavena) yucaipa* Pate. Orig. desig.  
*Timberlakena* subg. *Timberlakena* Pate, 1939. Amer. Ent. Soc., Trans. 64: 383.  
 Type-species: *Timberlakena (Timberlakena) nolcha* Pate. Orig. desig.

Females lack a tarsal pecten and pygidium so it is presumed that they may nest in pre-existing cavities, such as abandoned beetle borings, in twigs or structural lumber.

Revision: Pate, 1939. Amer. Ent. Soc., Trans. 64: 374-390, figs. 1, 2, 4, 5, 7-9, 13-16.  
*cahuilla* Pate. Calif. (Riverside Co.).

*Timberlakena (Riparena) cahuilla* Pate, 1939. Amer. Ent. Soc., Trans. 64: 378. ♀, ♂.  
*hualga* Pate. Calif.

*Timberlakena (Timberlakena) nolcha hualga* Pate, 1939. Amer. Ent. Soc., Trans. 64: 388.  
 ♀, ♂.

*nolcha* Pate. Ariz., Calif., Idaho.

*Timberlakena (Timberlakena) nolcha nolcha* Pate, 1939. Amer. Ent. Soc., Trans. 64: 385.  
 ♀, ♂.

*ocha* Pate. Calif. (Riverside Co.), Ariz.

*Timberlakena (Timberlakena) ocha* Pate, 1939. Amer. Ent. Soc., Trans. 64: 389. ♀.

*yucaipa* Pate. Calif. (San Bernardino Co.).

*Timberlakena (Mojavena) yucaipa* Pate, 1939. Amer. Ent. Soc., Trans. 64: 381. ♀, ♂.

## Family ASTATIDAE

So far as is known all members of this family are ground-nesting forms, making one or more cells per nest, and preying principally upon nymphal Hemiptera. The only group that occurs in the New World is the typical subfamily Astatinae.

### SUBFAMILY ASTATINAE

Taxonomy: Maidl and Klima, 1939. Hym. Cat., Pars 8, Sphecidae, pp. 7-29 (world catalog).  
 —Evans, 1958. Amer. Ent. Soc. Trans. 84: 109-113, Figs. 1-8, 46-48 (larvae). —Evans, 1959. Amer. Ent. Soc., Trans. 85: 165-166 (larvae). —Parker, 1962. Ent. Soc. Amer., Ann. 55: 643-644 (key to genera). —Parker, 1966. Ent. Soc. Amer., Ann. 59: 765-766, 10 figs. (key to N. Amer. genera).

Biology: Evans, 1958 (1957). N. Y. Ent. Soc., Jour. 65: 159-185, 8 figs. (ethology of world spp.).

### Genus DIPLOPECTRON Fox

*Diplopectron* Fox, 1893. Amer. Ent. Soc., Trans. 20: 38.

Type-species: *Liris ? brunneipes* Cresson. Monotypic.

Revision: Parker, 1972. Ent. Soc. Amer., Ann. 65: 1192-1203, 37 figs. (N. Amer. spp.).

Taxonomy: Ashmead, 1899. Ent. News 10: 55-56 (key to N. Amer. spp.). —Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 123-124 (key to N. Amer. spp.). —Krombein, 1939. Brooklyn Ent. Soc., Bul. 34: 138-139 (key to N. Amer. spp.).

*beccum* Parker. Calif., Nev., Utah, Ariz., southwest. Tex.

*Diplopectron beccum* Parker, 1972. Ent. Soc. Amer., Ann. 65: 1195, figs. 5, 19, 32. ♂, ♀.

*brunneipes* (Cresson). Idaho, Wyo., Colo., Calif. Ecology: Makes a nest of 2-3 cells in hard-packed sandy clay, stores 6 prey per cell. Prey: *Uhleriola floralis* (Uhler), nymphs.  
 Predator: *Philanthus pacificus* Cr.

*Liris ? brunneipes* Cresson, 1881. Amer. Ent. Soc., Trans. 9: Proc. p. iii. ♀ (misdet. in part), ♂.

*Diplopectron bidentatus* Ashmead, 1899. Ent. News 10: 56. "♀" = ♂.

*Diplopectron foxii* Ashmead, 1899. Ent. News 10: 56. ♀.

*Diplopectron bidentatiformis* Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 121. ♂.



- Taxonomy: Krombein, 1939. Brooklyn Ent. Soc., Bul. 34: 138 (synonymy). — Evans, 1975. Great Basin Nat. 35: 123-125, 5 figs. (larva).
- Biology: Evans, 1975. Great Basin Nat. 35: 123 (nest, prey).
- californicum** Parker. Calif., Oreg., Idaho. Prey: *Rhyarochromus californicus* Van D. adults, *Emblethis vicarius* Horv. ? nymphs, *Megalonotus chiragrus* (F.) adult.
- Diploplectron californicum* Parker, 1972. Ent. Soc. Amer., Ann. 65: 1199, figs. 1, 13, 25. ♂, ♀.
- Biology: Williams, 1946. Hawaii. Ent. Soc., Proc. 12: 648 (prey).
- diablense** Williams. Coast Range and Sierra Nevada Mts. of Calif.
- Diploplectron diablense* Williams, 1951 (1950). Wasmann Jour. Biol. 8: 363, fig. 1. ♂.
- Taxonomy: Williams, 1959. Wasmann Jour. Biol. 17: 303, fig. 5. ♀.
- ferrugineum** Ashmead. Idaho, Colo., N. Mex., Ariz., Calif.
- Diploplectron ferrugineus* Ashmead, 1899. Ent. News 10: 56. "♀" = ♂.
- Diploplectron ashmeadi* Rohwer, 1909. Amer. Ent. Soc. Trans. 35: 122. ♂.
- Diploplectron cressoni* Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 123. ♀.
- Diploplectron relativus* Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 123. ♀.
- fossor** Rohwer. B. C., Wyo., Colo., Utah, Nev., Calif. Prey: *Labops* sp. nymphs. Predator: *Phlanthus pacificus* Cr.
- Diploplectron fossor* Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 120. ♀.
- Diploplectron rufoantennatus* Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 120. ♂.
- Biology: Parker, 1972. Ent. Soc. Amer., Ann. 65: 1193 (prey).
- irwini** Parker. South Ariz.
- Diploplectron irwini* Parker, 1972. Ent. Soc. Amer., Ann. 65: 1200, figs. 7, 12. ♂.
- kantsi** Pate. Southwest. Tex., south. N. Mex.; Mexico (Tamaulipas).
- Diploplectron kantsi* Pate, 1941. Ent. News 52: 6. ♂.
- peglowi** Krombein. N. Y., N. W. T., Wyo., Colo., Utah, Idaho, Nev., Calif. Ecology: Nests in sand, making either a unicellular nest or 3-4 cells per nest and storing 2-6 prey per cell. Parasite: *Hedychridium* sp. ? Prey: *Sphaerobius insignis* (Uhl.), *Lygaeus* sp., *Emblethis vicarius* Horv., *Sphragisticus nebulosus* (Fall.); *Aufeius impressicollis* Stal. All prey specimens were nymphs.
- Diploplectron peglowi* Krombein, 1939. Brooklyn Ent. Soc., Bul. 34: 136. ♀, ♂.
- Biology: Williams, 1946. Hawaii. Ent. Soc., Proc. 12: 648 (prey, nest). — Parker, 1972. Ent. Soc. Amer., Ann. 65: 1193 (nest, prey). — Kurczewski, 1972. Ent. Soc. Wash., Proc. 74: 385-397, 4 figs. (nest, prey hunting and transport). — Kurczewski, 1975. Ent. Soc. Wash., Proc. 77: 97-99 (nest, prey, egg).
- reticulatum** Williams. South. Calif. and Ariz.
- Diploplectron reticulatus* Williams, 1946. Hawaii. Ent. Soc., Proc. 12: 648. ♂.
- Taxonomy: Williams, 1951 (1950). Wasmann Jour. Biol. 8: 365, fig. 2. ♀.
- secoense** Parker. Calif. in Coast Range and Sierra Nevada Mts.
- Diploplectron secoense* Parker, 1972. Ent. Soc. Amer., Ann. 65: 1201, figs. 7, 20, 29. ♂, ♀.
- sierrense** Parker. Sierra Nevada Mts. of Calif. and Nev.
- Diploplectron sierrense* Parker, 1972. Ent. Soc. Amer., Ann. 65: 1199, figs. 5, 15, 30, 36, 37. ♂, ♀.
- vierecki** Pate. South. Ariz. and N. Mex., southwest. Tex. Prey: *Microporus obliquus* Uhl. nymph.
- Diploplectron vierecki* Pate, 1941. Ent. News 52: 4. ♂.

#### Genus ASTATA Latreille

*Astatus* Latreille, 1796. Precis Caract. Gen. Ins., p. 114. No species.

*Astata* Latreille, 1796. Precis Caract. Gen. Ins., p. xiii. Emend.

Type-species: *Tiphia abdominalis* Panzer. Desig. by Latreille. First included species. *Astata* placed on Official List of Generic Names, Op. 139, Op. and Declar. Internatl. Comn. Zool. Nomencl., v. 2, sect. A, p. 37, 1943.

*Dimorpha* Panzer, 1806. Krit. Rev. Insektenf. Deutschlands, p. 126.

Type-species: *Tiphia abdominalis* Panzer. Monotypic.

The species of *Astata* build multicellular nests in soil of varying types ranging from sandy to hard-packed with included gravel. The cells may be in short series in some species separated by earthen partitions. They prey upon Hemiptera, principally Pentatomidae and Lygaeidae, and usually the nymphal stages.

Revision: Fox, 1892. Canad. Ent. 24: 232-235 (N. Amer. spp.). — Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 539-548 (N. Amer. spp.). — Parker, 1962. Ent. Soc. Amer., Ann. 55: 643-659, 42 figs. (spp. north of Mexico). — Parker, 1964. Ent. Soc. Amer., Ann. 57: 552-559, 21 figs. (Mexican and Cent. Amer. spp.).

*bakeri* Parker. Ont., Sask. to B. C., south to Tex. and Calif.; Mexico (Chihuahua, Jalisco, Guanajuato, Morelos, Puebla, Chiapas). Prey: *Nysius raphanus* How. adult and nymph, *Lygaeus bicrucis* Say ? nymph. Predator: *Philanthus crabroniformis* Sm.  
*Astata bakeri* Parker, 1962. Ent. Soc. Amer., Ann. 55: 647, text fig. 1, figs. 11, 21. ♂, ♀.

Biology: Williams, 1946. Hawaiian Ent. Soc., Proc. 12: 647 (prey; rec. as *Astata* sp.).

*bechteli* Parker. Desert areas, Wash. and Colo., south to Calif. and Tex.; Mexico (Sonora).

*Astata nubecula bechteli* Parker, 1962. Ent. Soc. Amer., Ann. 55: 649. ♂, ♀.

*bicolor* Say. Southern Canada and U. S. east of Rocky Mts.; Mexico (Chihuahua, Sonora, Durango, San Luis Potosi, Jalisco, Guanajuato, Mexico). Ecology: Nests in hard-packed sand, sometimes beneath overhanging vegetation, provides up to 5 cells per nest with 6-8 nymphs per cell. Prey: Pentatomidae spp.

*Astata bicolor* Say, 1823. West. Quart. Rptr. 2: 78. ♂, ♀.

*Astata terminata* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 218. ♂.

*Astatus pygidialis* Fox, 1892. Canad. Ent. 24: 234. ♀.

Taxonomy: Evans, 1959. Amer. Ent. Soc., Trans. 85: 165-166 (larva).

Biology: Peckham and Peckham, 1898. Wis. Geol. Nat. Hist. Survey, Bul. 2: 92-97, 217, pls. 1, 4, 9 (nest, prey). — Peckham and Peckham, 1905. Wasps Social and Solitary, pp. 287-289 (orientation flight). — Mickel, 1918 (1917). Nebr. Univ., Studies 17: 108 (prey). — Evans, 1962. N. Y. Ent. Soc., Jour. 70: 30-31 (nest, prey).

*bigeloviae* Cockerell. Western Tex. to Calif.; Mexico (Jalisco).

*Astatus bigeloviae* Cockerell, 1897. In Cockerell and Fox, Acad. Nat. Sci. Phila., Proc. 49: 138. ♀.

*boharti* Parker. N. Mex., Ariz.

*Astata boharti* Parker, 1962. Ent. Soc. Amer., Ann. 55: 650, fig. 25. ♂, ♀.

*clypeata* Parker. East slope of Rocky Mts. in U. S.; Mexico (western mts.).

*Astata clypeata* Parker, 1962. Ent. Soc. Amer., Ann. 55: 651, figs. 15, 26. ♂, ♀.

*femorata* Parker. Ariz. (Pena Blanca in Santa Cruz Co.).

*Astata femorata* Parker, 1963. Pan-Pacific Ent. 39: 185, figs. 1-3. ♂.

*leuthstromi* Ashmead. Alaska, Canada, northern U. S., south in mts. to Ariz. Ecology: Nests in soil, sometimes beneath overhanging vegetation, provides 2 cells per nest with up to 5 nymphal prey per cell. Prey: *Acrosternum hilare* Say, *Cosmopepla bimaculata* Thom.

*Astata leuthstromi* Ashmead, 1897. Psyche 8: 129. ♀.

Biology: Peckham and Peckham, 1898. Wis. Geol. Nat. Hist. Survey, Bul. 2: 98 (nest, prey).

— Evans, 1958 (1957). N. Y. Ent. Soc., Jour. 65: 176-177 (nest, prey transport). — Evans, 1962. N. Y. Ent. Soc., Jour. 70: 31-32 (nest, prey).

*mexicana* Cresson. Canada and U. S. west of Rocky Mts.; Mexico south to El Salvador.

*Astata mexicana* Cresson, 1881. Amer. Ent. Soc., Trans. 9: Proc. p. v. ♂.

*nevadica* Cresson. Western Canada and U. S.; Mexico (Chihuahua, Sonora, Durango, Zacatecas, Guanajuato, Mexico).

*Astata nevadica* Cresson, 1881. Amer. Ent. Soc., Trans. 9: Proc. p. v. ♀.

*nubecula* Cresson. N. W. T., northern U. S. south to Va. in east and along mts. in Great Basin and in Calif. to San Diego. Ecology: Nests in hard, bare stony soil or in sand, provides up to 8 cells per nest, each cell provisioned with 2-4 nymphs. Parasite: *Senotainia*

- trilineata* Wulp, *Hilarella hilarella* Zett. ? Prey: *Chlorochroa uhleri* Stal ?, *Thyanta* sp., prob. *casta* Stal or *pallidovirens* Stal, Pentatomidae sp. Predator: *Philanthus zebratus nitens* (Bks.), *P. crabroniformis* Sm.
- Astata nubecula* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 466. ♂.
- Astata nigropilosa* Cresson, 1881. Amer. Ent. Soc., Trans. 9: Proc. p. iv. ♂, ♀.
- Biology: Parker, 1962. Ent. Soc. Amer., Ann. 55: 649 (nest, prey). — Evans, 1970. Mus. Compar. Zool., Bul. 140: 487-488 (male territoriality, nest, prey, parasites).
- occidentalis** Cresson. South. Canada, U. S.; Mexico (Chihuahua, Baja California, Guanajuato, Morelos, Michoacan, Puebla). Ecology: Nests in hard-packed clay devoid of vegetation, makes up to 14 cells per nest, and stores 3-9 usually adult prey per cell. Parasite: *Senotainia trilineata* Wulp; Diptera sp. Prey: *Hymenarcys nervosa* Say, *Thyanta calceata* (Say), *T. p. pallidovirens* Stal, *T. p. accerra* McAtee, *T. brevis* Van D., *T. custard* F., *T. punctiventris* Van D., *Euschistus variolarius* (Beauv.), *Holcostethus limbolarius* (Stal), *Banasa calva* (Say), *Perillus bioculatus* (F.), *Trichopepla* sp.
- Astata occidentalis* Cresson, 1881. Amer. Ent. Soc., Trans. 9: Proc. p. iii. ♂.
- Astata apicipennis* Cameron, 1890. Biol. Cent.-Amer., Hym., v. 2, p. 66, pl. 5, fig. 1. ♀.
- Astata tinctipennis* Cameron, 1890. Biol. Cent.-Amer., Hym. v. 2, p. 67. ♂.
- Astatus sayi* Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 542. ♀.
- Taxonomy: Evans, 1958. Amer. Ent. Soc., Trans. 84: 110-111, figs. 1-8 (larva). — Parker, 1964. Ent. Soc. Amer., Ann. 57: 559 (synonymy).
- Biology: Evans, 1958 (1957). N. Y. Ent. Soc., Jour. 65: 168-176, figs. 3-8 (nest, prey transport, parasite). — Powell and Burdick, 1960. Pan-Pacific Ent. 36: 25-30 (nest, prey transport, parasite).
- unicolor** Say. Southern Canada, U. S.; Mexico to El Salvador, Cuba, Jamaica. Ecology: Nests usually beneath overhanging vegetation in hard-packed sand or heavier soil containing gravel, makes 12-14 cells in a complete nest, and stores 2-4 nymphal prey per cell. Parasite: *Chrysis* sp. Prey: *Podisus modestus* F., *P. maculiventris* (Say), *Euschistus tristigmus* Say, *E. euschistoides* (Voll.) ?
- Astata unicolor* Say, 1824. In Keating, Narr. Long's 2nd Exped. v. 2, p. 337. ♀.
- Astata insularis* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 140. ♀.
- Astata rufiventris* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 218. ♀.
- Taxonomy: Evans, 1958. Amer. Ent. Soc., Trans. 84: 111-112, figs. 46-48 (larva).
- Biology: Peckham and Peckham, 1898. Wis. Geol. Nat. Hist. Survey, Bul. 2: 88-92, pls. 9, 11, 12 (nest, prey, parasite). — Peckham and Peckham, 1905. Wasps Social and Solitary, pp. 289-290 (orientation flight). — Evans, 1958 (1957). N. Y. Ent. Soc., Jour. 65: 160-168, figs. 1, 2 (nest, prey hunting and transport, male behavior, life cycle).
- Morphology: Snodgrass, 1941. Smithsn. Inst., Misc. Collect. 99 (14): pl. 20, figs. L, M (male genitalia).
- williamsi** Parker. Oreg., Idaho, Utah, Nev., Calif.
- Astata williamsi* Parker, 1962. Ent. Soc. Amer., Ann. 55: 653, figs. 14, 29, 35, 36. ♂, ♀.

### Genus DRYUDELLA Spinola

*Dryudella* Spinola, 1843. Soc. Ent. France, Ann. (2) 1: 135.

Type-species: *Dryudella ghilianii* Spinola. Desig. by Verhoeff, 1951.

Members of this genus have a wider prey range than other genera of the subfamily. In addition to Pentatomidae and Lygaeidae, they have been reported to prey upon Scutelleridae, Reduviidae, Cydnidae, Alydidae and Rhopalidae; both nymphs and adults are preyed upon.

Revision: Parker, 1969. Ent. Soc. Amer., Ann. 62: 963-976, 67 figs. (New World spp.).

**bella** (Cresson). Idaho, Nev., Calif., Ariz., N. Mex.; Mexico.

*Astata bella* Cresson, 1881. Amer. Ent. Soc., Trans. 9: Proc. p. vi. ♂.

**caerulea** (Cresson). Wash., Idaho, Colo., Nev., Calif., Ariz., N. Mex.; Mexico south to Puebla.

Ecology: Nests in sand under vegetation, 3 cells per nest, with 4-6 prey per cell. Prey:

*Hyalmenus tarsatus* (F.) nymphs; *Euschistus conspersus* Uhl. nymphs.

*Astata caerulea* Cresson, 1881. Amer. Ent. Soc., Trans. 9: Proc. p. iv. ♂.

- Biology: Alcock, 1973. Wasmann Jour. Biol. 31: 328-329, fig. 4 (nest, prey).  
*elegans* (Cresson). Idaho, Wyo., Utah, Nev., Calif., Ariz.  
*Astata elegans* Cresson, 1881. Amer. Ent. Soc., Trans. 9: Proc. p. vi. ♂, ♀.
- immigrans* (Williams). Wash., Idaho and Wyo. south to Calif. and southwest. Tex.; Hawaii; Mexico south to Chiapas including Baja California. Prey: *Nysius caenosulus* Stal nymphs. Adventive in Hawaii.  
*Astata immigrans* Williams, 1946. Hawaii. Ent. Soc., Proc. 12: 641. ♂, ♀.
- Biology: Williams, 1946. Hawaii. Ent. Soc., Proc. 12: 642-648 (prey, nesting under lab. conditions).
- millsi* Cockerell. Colo. (Canad. Zone of Long's Peak).  
*Dryudella millsii* Cockerell, 1914. Ent. News 25: 32. ♀.
- montana* (Cresson). Wash. to Wyo. south to Calif. and Colo. Ecology: Nests in flat, bare sand, makes 2-3 cells per nest. Parasite: *Senotainia trilineata* (Wulp). Prey: *Zelus* or *Pseliopus* sp.; *Eurygaster alternatus* Say; *Corimelaena montana* Van D.; *Alydus* sp.; *Aufeius impressicollis* Stal; *Euschistus conspersus* Uhl. All observed prey were nymphs.  
*Astata montana* Cresson, 1881. Amer. Ent. Soc., Trans. 9: Proc. p. v. ♀.  
*Diploplectron florissantensis* Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 122. ♀.
- Biology: Evans, 1963. Ent. News 74: 236 (nest, prey). — Parker, 1969. Ent. Soc. Amer., Ann. 62: 965 (prey). — Alcock, 1973. Wasmann Jour. Biol. 31: 324-326, figs. 2, 3, 7, 8 (nest, prey transport, parasite).
- pernix* Parker. South. Calif. to southwest. Tex.; Mexico (Hidalgo).  
*Dryudella pernix* Parker, 1969. Ent. Soc. Amer., Ann. 62: 972, figs. 13, 22, 25, 40, 54, 66. ♂, ♀.
- picta* (Kohl). N. W. T., Oreg., Calif., Idaho, Nev., Utah, Colo., Ariz.; Mexico south to Morelos.  
 Prey: *Liorhyssus hyalinus* (F.) adult; *Lygus* sp. nymphs in laboratory.  
*Astatus pictus* Kohl, 1888. Zool.-Bot. Gesell. Wien, Verhandl. 38: 146. ♂.  
*Astata Kohli* Cameron, 1890. Biol. Cent.-Amer., Hym., v. 2, p. 68, pl. 5, figs. 2, 2a. ♀.  
*Astatus asper* Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 546. ♂, ♀.  
*Astata aspera* Dalla Torre, 1897. Cat. Hym., v. 8, p. 651. Emend.  
*Astata asperiformis* Rohwer, 1909. Ent. News 20: 371. ♂.
- Biology: Parker, 1969. Ent. Soc. Amer., Ann. 62: 965 (prey). — Steiner, 1973. Quaestiones Ent. 9: 23 (mating flight).
- pinguis* (Dahlbom). Alaska, N. W. T., Colo.; northern Europe and Asia. Prey: *Trapezonotus arenarius* (L.), *Drymus sylvaticus* (F.), *Nysius thymi* (Wolff) ? in Europe.  
*Larra pinguis* Dahlbom, 1832. Exercit. Hym., fasc. 4, p. 50. ♀.  
*Astata jaculator* Smith, 1845. Zoologist 3: 1157. ♀.
- Biology: Verhoeff, 1951. Zool. Meded. 31: 162 (prey in Europe).
- rhimpa* Parker. B. C. to Calif., and Idaho and Wyo. to N. Mex.; Mexico south to Queretaro.  
 Ecology: Nests in compact soil containing gravel. Prey: *Thyanta punctiventris* Van D. nymphs and adult; *Lygaeus* sp. nymph; *Leptocoris trivittatus* (Say) nymph.  
*Dryudella rhimpa* Parker, 1969. Ent. Soc. Amer., Ann. 62: 970, figs. 5, 8, 17, 30, 44, 55, 62. ♂, ♀.
- Biology: Parker, 1969. Ent. Soc. Amer., Ann. 62: 965 (nest, prey).

## Family LARRIDAE

The contributions cited below treat only the subfamilies Larrinae and Miscophinae because the Trypoxyloninae have been associated with the former two groups only since 1964. The revisions are quite inadequate for identification in most genera for many additional species have been described in intervening years.

Revision: Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc., 45: 467-551 (U. S. spp.). —Williams, 1914 (1913). Kans. Univ. Sci. Bul. 8: 121-213, pls. 22-30 (Kans. spp.).

Taxonomy: Evans, 1958. Amer. Ent. Soc., Trans. 84: 113-126, figs. 9-45, 58, 59 (larvae).  
—Evans, 1959. Amer. Ent. Soc., Trans. 85: 166-167, figs. 54-59 (larvae).

### SUBFAMILY LARRINAE

All of the American genera are ground-nesting but one extralimital genus is known to nest in twigs. The North American species are reported to prey upon various kinds of Orthoptera. However, no prey preference has been reported for our single species of *Prosopigastra*; in Europe some species of the genus prey upon Hemiptera and Homoptera. One extralimital genus preys upon lepidopterous larvae.

### TRIBE LARRINI

#### Genus LARRA Fabricius

#### Genus LARRA Subgenus LARRA Fabricius

*Larra* Fabricius, 1793. Ent. System., v. 2, p. 220.

Type-species: *Larra ichneumoniformis* Fabricius. Desig. by Latreille, 1810.

*Larrana* Rafinesque, 1815. Analyse Nature ou Tabl. Univers, Palmero, p. 124. Emend. or n. name.

*Lara* Drapiez, 1819. Bruxelles Gen. Sci. Phys., Ann., v. 1, p. 54. Lapsus or emend.

*Monomatium* Shuckard, 1840. In Swainson and Shuckard, Cabinet Cyclopaedia of Lardner, v. 129, p. 181. No species.

Type-species: *Larraxena princeps* Smith. Desig. by Pate, 1935. First included species.

*Tachytes* subg. *Lyrops* Dahlbom, 1843. Hym. Europaea, v. 1, p. 132. Preocc.

Type-species: *Tachytes (Lyrops) pagana* Dahlbom. Monotypic.

*Larraxena* Smith, 1851. Ann. and Mag. Nat. Hist. (2) 7: 30.

Type-species: *Larraxena princeps* Smith. Monotypic.

*Larrada* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 337.

Type-species: *Sphex anathema* Rossi. Orig. desig.

Only the typical subgenus occurs in North America. *Larra* preys upon mole crickets and several extralimital species have been introduced into other areas for control of these pests.

*analis* Fabricius. East. states north to N. Y., south to Fla., La., west to Tex., Nebr. Prey:

*Gryllotalpa hexadactyla* Perty.

*Larra analis* Fabricius, 1804. Systema Piezatorum, p. 220. ♀.

*Larrada canescens* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 292. ♀.

*Larrada americana* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 214. ♂.

*Larra cressonii* Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 482. N. name.

Taxonomy: Cushman, 1935. Ent. Soc. Wash., Proc. 37: 82-87 (larva).

Biology: Smith, 1935. Ent. Soc. Wash., Proc. 37: 65-82.

Morphology: Snodgrass, 1941. Smithsn. Inst., Misc. Collect. 99 (14): pl. 20, figs. N, P, Q (male genitalia).

## Genus LIRIS Fabricius

## Genus LIRIS Subgenus LIRIS Fabricius

*Liris* Fabricius, 1804. *Systema Piezatorum*, p. 227.

Type-species: *Sphex aurata* Fabricius. Desig. by Patton, 1881.

*Liris* Rafinesque, 1815. *Analyse Nature ou Tabl. Univers*, Palermo, p. 124. Emend. or n. name.

The typical subgenus does not occur in the New World.

## Genus LIRIS Subgenus LEPTOLARRA Cameron

*Notogonia* Costa, 1867. *Mus. Zool. Univ. Napoli*, Ann. 4: 83. Preocc.

Type-species: *Tachytes nigra* Fabricius of Vander Linden. Monotypic.

*Caenolarra* Cameron, 1900. *Ann. and Mag. Nat. Hist.* (7) 5: 28.

Type-species: *Caenolarra appendiculata* Cameron. Monotypic.

*Leptolarra* Cameron, 1900. *Ann. and Mag. Nat. Hist.* (7) 5: 29.

Type-species: *Leptolarra reticulata* Cameron. Desig. by Richards, 1935.

*Spanolarra* Cameron, 1900. *Ann. and Mag. Nat. Hist.* (7) 5: 32.

Type-species: *Spanolarra rufitarsis* Cameron. Monotypic.

*Notogonia* Howard(!), 1901. *Insect Book*, pl. 6, fig. 1. Lapsus.

*Chrysolarra* Cameron, 1901. *Ann. and Mag. Nat. Hist.* (7) 8: 118.

Type-species: *Chrysolarra appendiculata* Cameron. Desig. by Pate, 1937.

*Notogonia* Rohwer, 1911. *Ent. Soc. Wash.*, Proc. 13: 234. N. name.

*Dociliris* Tsuneki, 1967. *Etizenia* 20: 26.

Type-species: *Larrada subtessellata* Smith. Orig. desig.

*Nigiliris* Tsuneki, 1967. *Etizenia* 20: 27.

Type-species: *Notogonia japonica* Kohl. Orig. desig.

*Liris* subg. *Colloliris* Tsuneki, 1974. *Polskie Pismo Ent.* 44: 612.

Type-species: *Notogonia negrosensis* Williams. Orig. desig.

The species of *Leptolarra* nest in soil, making one or several cells per nest at the end of a rather short burrow. The usual prey are crickets, although one extralimital species has been reported to use *Gryllacrididae*. Both nymphal and adult stages are used as prey, but in North America the nymphs are used more frequently.

Taxonomy: Krombein, 1954. *Amer. Ent. Soc.*, Trans. 80: 15-17 (key to U. S. spp.).

*apicipennis* (Cameron). South. Tex. to Panama.

*Notogonia apicipennis* Cameron, 1889. *Biol. Cent.-Amer.*, Hym., v. 2, p. 58, pl. 4, figs. 16, 16a. ♀, ♂.

*argentata* (Beauvois). South. Ont. west to Nev., south to Fla., Ariz. and south. Calif.; south in Mexico to Chiapas, Venezuela ?; Cuba, Bahamas; adventive in Hawaii. Ecology: Nests in sand or compacted soil, makes 1-3 cells per nest and provides 1-6 prey per cell. Prey: *Gryllus pennsylvanicus* Burm., *G. rubens* (Scudd.)?, *G. sp.*, *Miogryllus verticalis* (Serv.), *Acheta assimilis* F., *Nemobius fasciatus* DeG., *N. sp.*, *Orocharis saltator* Uhl.; most prey records are of nymphs, but adults are used occasionally.

*Larra Pennsylvanica* Beauvois, 1811. *Ins. Afr.*, Amer., p. 118.

*Larra argentata* Beauvois, 1811. *Ins. Afr.*, Amer., p. 119. ♀.

*Tachytes murina* Dahlbom, 1843. *Hym. Europaea*, v. 1, p. 132. ♀. N. syn.

*Larrada Pennsylvanica* Smith, 1856. *Cat. Hym. Brit. Mus.*, v. 4, p. 292. Emend.

*Larra nuda* Taschenberg, 1870. *Ztschr. Gesam. Naturw. Halle* 34: 5. ♀.

Taxonomy: Krombein, 1976. *Ent. Soc. Wash.*, Proc. 78: 333 (syn. of *murina*).

Biology: Ashmead, 1894. *Psyche* 7: 63 (nest, prey). — Williams, 1914 (1913). *Kans. Univ. Sci.*

Bul. 8: 189-192, fig. 118 (nest, prey hunting and transport). — Rau and Rau, 1918. Wasp studies afield, pp. 152-158, fig. 35 (nest, prey). — Rau, 1922. *Acad. Sci. St. Louis. Trans.* 24 (7): 26 (prey, nest). — Reinhard, 1929. *Witchery of wasps*, pp. 67-71 (nest, prey).

— Krombein and Evans, 1955. *Ent. Soc. Wash.*, Proc. 57: 233 (prey). — Krombein, 1958. *Ent. Soc. Wash.*, Proc. 60: 103 (prey). — Kurezewski and Kurezewski, 1971. *Kans. Ent. Soc.*, Jour. 44: 134 (prey).

**argenticauda** (Cameron). South. Tex. to Costa Rica.

*Notogonia chrysura* Cameron, 1889. Biol. Cent.-Amer., Hym., v. 2, p. 57. pl. 4, fig. 14. ♂.

*Notogonia argenticauda* Cameron, 1889. Biol. Cent.-Amer., Hym., v. 2, p. 58, pl. 4, fig. 15. ♂.

**beata** (Cameron). Transcont. in U. S. mostly in Austr. Zone south to Panama. Prey: *Acheta assimilis* F. nymph.

*Notogonia violaceipennis* Cameron, 1889. Biol. Cent.-Amer., Hym., v. 2, p. 51, pl. 4, fig. 12. ♀. N. syn.

*Notogonia montezuma* Cameron, 1889. Biol. Cent.-Amer., Hym., v. 2, p. 52. ♀. N. syn.

*Notogonia truncata* Cameron, 1889. Biol. Cent.-Amer., Hym., v. 2, p. 54. ♀. Preocc. N. syn.

*Notogonia beata* Cameron, 1889. Biol. Cent.-Amer., Hym., v. 2, p. 56, pl. 4, fig. 13. ♂.

*Notogonia nigripennis* Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 485. ♀. Preocc. N. syn.

*Notogonia aequalis* Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 486. ♀. N. syn.

*Larra nigripennata* Dalla Torre, 1897. Cat. Hym., v. 8, p. 670. N. name for *nigripennis* Fox. N. syn.

*Larra truncatula* Dalla Torre, 1897. Cat. Hym., v. 8, p. 675. N. name for *truncata* Cameron. N. syn.

*Notogonia nigripennis* var. *occidentalis* Viereck, 1903 (1902). Acad. Nat. Sci. Phila., Proc. 54: 731. ♀. N. syn.

*Notogonia subaequalis* Rohwer, 1909. Ent. News. 20: 370. ♀. N. syn.

Biology: Krombein, 1958. U. S. Dept. Agr., Monog. 2, Sup. 1: 188 (prey).

**fuliginosa muspa** (Pate). South. Fla. Typical *fuliginosa* (Dahlbom) occurs in Cuba and Puerto Rico.

*Motes muspa* Pate, 1943. Canad. Ent. 75: 201. ♂.

Taxonomy: Krombein, 1976. Ent. Soc. Wash., Proc. 78: 333-334 (lectotype of *fuliginosa*).

**luctuosa dahlbomi** (Cresson). South. Fla.; Cuba, Puerto Rico, Virgin Islands, Dominica.

Typical *luctuosa* (Smith) occurs in Santo Domingo, Mexico and Brazil.

*Larrada dahlbomi* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 138. ♀. A provisional name to be used if specimens identified as *fuliginosa* (Dahlbom) by Cresson were misidentified; they were.

Taxonomy: Krombein, 1976. Ent. Soc. Wash., Proc. 78: 334-335 (lectotype of *dahlbomi*).

**mescalero** (Pate). South. Tex. to south. Ariz., south to Honduras.

*Motes mescalero* Pate, 1943. Canad. Ent. 75: 200. ♂.

**panamensis muesebecki** (Krombein), n. status. South. Fla.

*Motes muesebecki* Krombein, 1954. Amer. Ent. Soc., Trans. 80: 15. ♂, ♀.

**panamensis panamensis** (Cameron), n. status. South. Tex. to Panama.

*Notogonia panamensis* Cameron, 1889. Biol. Cent.-Amer., Hym., v. 2, p. 59, pl. 4, fig. 17. ♂.

*Notogonidea sternalis* Rohwer, 1914. U. S. Natl. Mus., Proc. 47: 519. ♂. N. syn.

#### UNPLACED TAXON OF LARRINI

*Tachytes dives* Lepeletier, 1845. Hist. Nat. Ins. Hym., v. 3, p. 247. "♀" = ♂. Carolina. Bohart and Menke (1975) treat this as a questionable species of *Liris*. Presumably the locality is in error, for no species of Larrini in America north of Mexico has the coloration of vestiture, antenna and legs ascribed to *dives*.

#### TRIBE TACHYTINI

##### Genus LARROPSIS Patton

*Larropsis* Patton, 1892. Ent. News 3: 90.

Type-species: *Larrada tenuicornis* Smith. Orig. desig.

So far as known this genus is restricted to the Nearctic Region. The scanty biological records indicate that the species are ground-nesting and that they prey upon cave and camel crickets (Gryllacrididae).

- Revision: Bohart and Bohart, 1966. Amer. Ent. Soc., Trans. 92: 653-685, 23 figs.  
**arizonensis** Bohart and Bohart. Ariz., N. Mex., Utah.  
*Larropsis arizonensis* Bohart and Bohart, 1966. Amer. Ent. Soc., Trans. 92: 660, fig. 5. ♀, ♂.
- atra** Williams. Nebr., Kans., west. Tex., N. Mex., Ariz.  
*Larropsis ater* Williams, 1914 (1913). Kans. Univ. Sci. Bul. 8: 146. ♂.
- chilopsidis** (Cockerell). Kans., Colo., west. Tex., N. Mex.; Mexico (Chihuahua).  
*Ancistromma chilopsidis* Cockerell, 1897. In Cockerell and Fox, Acad. Nat. Sci. Phila., Proc. 49: 137. ♀.  
*Ancistromma zerbeii* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 208. ♀.  
*Ancistromma tachysphecoides* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 209. ♂.
- conferta** (Fox). Mont., Nebr., Iowa, Kans., Colo., Tex.  
*Ancistromma conferta* Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 494. ♀.  
*Ancistromma paenerugosa* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 210. ♂.  
*Ancistromma bruneri* Smith, 1906. Ent. News 17: 248. ♂.  
*Larropsis minor* Williams, 1914 (1913). Kans. Univ. Sci. Bul. 8: 146. ♂.  
*Larropsis gracilis* Rohwer, 1915. U. S. Natl. Mus., Proc. 49: 244. ♀, ♂.
- consimilis** (Fox). Kans., Okla., Tex., N. Mex.  
*Ancistromma consimilis* Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 496. ♀.  
*Ancistromma vegetoides* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 208. ♀.
- deserta** Bohart and Bohart. South. Calif. deserts.  
*Larropsis deserta* Bohart and Bohart, 1966. Amer. Ent. Soc., Trans. 92: 665, figs. 4, 23. ♀, ♂.
- discreta** (Fox). Ga., Fla.  
*Ancistromma discreta* Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 493. ♀.
- divisa** (Patton). Mont., Wyo., Nebr., Kans., north. Tex., N. Mex. Ecology: Nests in burrow off crack in hard-packed soil. Prey: *Ceuthophilus* sp. nymphs.  
*Larra divisa* Patton, 1879. U. S. Geol. Geog. Survey, Bul. 5: 368. ♀.  
 Biology: Williams, 1914 (1913). Kans. Univ. Sci. Bul. 8: 192-193 (nest, prey).
- elegans** Bohart and Bohart. South. Tex., southeast N. Mex.  
*Larropsis elegans* Bohart and Bohart, 1966. Amer. Ent. Soc., Trans. 92: 667, figs. 1, 16. ♀, ♂.
- filicornis** Rohwer. West. Nebr., south. Okla., southeast. Tex. Prey: *Ammobaenetes* sp. nymph.  
*Larropsis filicornis* Rohwer, 1911. U. S. Natl. Mus., Proc. 40: 582. ♀.  
*Larropsis yatesi* Mickel, 1918 (1917). Nebr. Univ., Studies 17: 412. ♂.  
 Biology: Bohart and Bohart, 1966. Amer. Ent. Soc., Trans. 92: 655 (prey).
- greenei** Rohwer. N. J., S. C., Fla., Kans.  
*Larropsis greenei* Rohwer, 1917. U. S. Natl. Mus., Proc. 53: 173. ♀.
- interocularis** Bohart and Bohart. Kans., Ariz.  
*Larropsis interocularis* Bohart and Bohart, 1966. Amer. Ent. Soc., Trans. 92: 670, figs. 4, 8. ♀, ♂.
- lucida** Bohart and Bohart. Ariz. (Mohave Co.).  
*Larropsis lucida* Bohart and Bohart, 1966. Amer. Ent. Soc., Trans. 92: 671, fig. 7. ♀.
- rugosa** (Fox). Mont., N. Dak. and Iowa south to Kans. and Ariz.; Mexico (Chihuahua, Durango, Zacatecas).  
*Ancistromma rugosa* Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 496. ♂.
- sericea** Bohart and Bohart. Nebr., Kans., Tex.  
*Larropsis sericea* Bohart and Bohart, 1966. Amer. Ent. Soc., Trans. 92: 672, fig. 6. ♀, ♂.
- snowi** Bohart and Bohart. Ariz. in U. and L. Sonoran Zones.  
*Larropsis snowi* Bohart and Bohart, 1966. Amer. Ent. Soc., Trans. 92: 673, figs. 6, 18. ♀, ♂.



- sparsa* Bohart and Bohart. West. Tex., N. Mex., Ariz.; Mexico (Coahuila, Durango).  
*Larropsis sparsa* Bohart and Bohart, 1966. Amer. Ent. Soc., Trans. 92: 675, fig. 6. ♂.
- striata* Bohart and Bohart. Calif. (San Bernardino Co.).  
*Larropsis striata* Bohart and Bohart, 1966. Amer. Ent. Soc., Trans. 92: 676, fig. 5. ♂.
- tenuicornis* (Smith). Wash., Idaho, Oreg., Nev., Calif.; Mexico (Baja California).  
*Larrada tenuicornis* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 293. ♀.
- testacea* Bohart and Bohart. Kans. (Pottawatomie Co.).  
*Larropsis testacea* Bohart and Bohart, 1966. Amer. Ent. Soc., Trans. 92: 677, figs. 5, 14. ♀.
- texensis* Bohart and Bohart. Cent. and south. Tex.  
*Larropsis texensis* Bohart and Bohart, 1966. Amer. Ent. Soc., Trans. 92: 678, fig. 7. ♂.
- uniformis* Bohart and Bohart. Idaho, Nev. to Colo. south to Calif. and N. Mex.; Mexico (Chihuahua, Coahuila, Durango).  
*Larropsis uniformis* Bohart and Bohart, 1966. Amer. Ent. Soc., Trans. 92: 678, figs. 2, 12, 13. ♀, ♂.
- vegeta* (Fox). Wyo., Nebr., Colo., west. Tex., north. Ariz.  
*Ancistromma vegeta* Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 497. ♀, ♂.
- washoensis* Bohart and Bohart. Nev. (Washoe Co.).  
*Larropsis washoensis* Bohart and Bohart, 1966. Amer. Ent. Soc., Trans. 92: 681, figs. 3, 10, 15, 17, 21. ♀, ♂.

### Genus ANCISTROMMA Fox

*Ancistromma* Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 487.

Type-species: *Larrada distincta* Smith. Desig. by Rohwer, 1911.

These ground-nesting wasps apparently construct multicelled nests at the bottom of pre-existing burrows or cavities. The recorded prey includes both typical crickets (Gryllidae) and cave crickets (Gryllacrididae); both nymphs and adults are used.

Revision: Bohart and Bohart, 1962. Ent. Soc. Wash., Proc. 64: 21-37, 32 figs. (N. Amer. spp.).

*aurantia* (Fox). Alta. east to N. Dak., south to Ariz. and Kans. Prey: *Ceuthophilus fusiformis* Scudd.

*Larra aurantia* Fox, 1891. Ent. News 2: 194. ♀.

*Ancistromma aurulenta* (!) Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 388.

Biology: Bohart and Bohart, 1962. Ent. Soc. Wash., Proc. 64: 25 (prey).

*bradleyi* (Bohart and Bohart). Oreg., Calif.

*Larropsis (Ancistromma) bradleyi* Bohart and Bohart, 1962. Ent. Soc. Wash., Proc. 64: 25, figs. 20, 21, 31. ♀, ♂.

*capax* (Fox). B. C., Alta., east to N. Dak., south to Calif., Kans. and N. Mex. Prey:

*Ceuthophilus* sp., nymph. Predator: *Philanthus zebratus* Cr.

*Ancistromma capax* Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 490. ♀.

*Ancistromma dolosa* Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 492. ♀.

*Larropsis dolosana* Rohwer, 1915. U. S. Natl. Mus., Proc. 49: 245. ♀.

*Larropsis picina* Mickel, 1916. Amer. Ent. Soc., Trans. 42: 418. ♀, ♂.

Biology: Bohart and Bohart, 1962. Ent. Soc. Wash., Proc. 64: 30 (prey).

*corrugata* (Bohart and Bohart). B. C., Oreg., Calif.

*Larropsis (Ancistromma) corrugata* Bohart and Bohart, 1962. Ent. Soc. Wash., Proc. 64: 31, figs. 3, 18, 19, 27. ♀, ♂.

*distincta* (Smith). Transcont., B. C. to Maine, south to Calif., Kans., N. C. Ecology: Nests in natural cavities in coarse soil, making up to 9 cells per nest, each cell provided with 1-3 adult crickets. Parasite: *Metopia argyrocephala* (Meig.), *Senotainia trilineata* (Wulp).

Prey: *Nemobius fasciatus* (DeG.) adults.

*Larrada distincta* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 292. ♀.

*Larropsis distincta* var. *semirufa* Banks, 1921. Ent. Soc. Amer., Ann. 14: 19. ♀, ♂.

Taxonomy: Evans, 1958. Amer. Ent. Soc., Trans. 84: 119-120, figs. 29-38 (larva).

Biology: Evans, 1958. Ent. News 69: 197-200 (nest, prey, parasites).

**granulosa** (Bohart and Bohart). Calif., Nev., Idaho, Ariz., N. Mex.

*Larropsis (Ancistromma) granulosa* Bohart and Bohart, 1962. Ent. Soc. Wash., Proc. 64: 33, figs. 4, 6, 7, 28. ♀, ♂.

**hurdi** (Bohart and Bohart). Calif.

*Larropsis (Ancistromma) hurdi* Bohart and Bohart, 1962. Ent. Soc. Wash., Proc. 64: 34, figs. 5, 8, 9, 30. ♀, ♂.

**platynota** (Bohart and Bohart). Ariz. (Tucson).

*Larropsis (Ancistromma) platynota* Bohart and Bohart, 1962. Ent. Soc. Wash., Proc. 64: 35, figs. 24, 32. ♀.

**portiana** (Rohwer). Western Tex., N. Mex.

*Larropsis portianus* Rohwer, 1911. U. S. Natl. Mus., Proc. 40: 583. ♀, ♂.

**sericifrons** Smith. Nebr., Wyo., Tex., N. Mex., Ariz.

*Ancistromma sericifrons* Smith, 1906. Ent. News 17: 247. ♂.

*Larropsis rubens* Mickel, 1918 (1917). Nebr. Univ., Studies 17: 329. ♀.

**shappirioi** (Bohart and Bohart). D. C., Va.

*Larropsis (Ancistromma) shappirioi* Bohart and Bohart, 1962. Ent. Soc. Wash., Proc. 64: 37, figs. 14, 15, 28. ♀, ♂.

### Genus TACHYTES Panzer

*Tachytes* Panzer, 1806. Krit. Rev. Insektenf. Deutschlands, v. 2, p. 129.

Type-species: *Sphex tricolor* Fabricius. Monotypic.

*Lyrops* Illiger, 1807. Fauna Etrusca, v. 2, p. 162.

Type-species: *Andrena etrusca* Rossi. Monotypic.

*Tachyptera* Dahlbom, 1843. Hym. Europaea, v. 1, p. 133. Preocc.

Type-species: *Apis obsoleta* Rossi. Desig. by Patton, 1880.

*Tachytes* subg. *Holotachytes* Turner, 1917. Ann. and Mag. Nat. Hist. (8) 20: 10.

Type-species: *Tachytes dichroa* Smith. Orig. desig.

*Tachytes* subg. *Calotachytes* Turner, 1917. Ann. and Mag. Nat. Hist. (8) 20: 10.

Type-species: *Tachytes marshalli* Turner. Orig. desig.

*Tachyoides* Banks, 1942. Mus. Compar. Zool., Bul. 89: 397.

Type-species: *Tachytes mergus* Fox. Orig. desig.

*Tachytes* subg. *Tachyplena* Banks, 1942. Mus. Compar. Zool., Bul. 89: 397. N. name.

*Tachytes* subg. *Tachynana* Banks, 1942. Mus. Compar. Zool., Bul. 89: 398.

Type-species: *Tachytes obscurus* Cresson. Orig. desig.

Members of this genus are ground-nesting and usually construct multicellular nests. Some species begin their burrows in pre-existing holes such as rodent burrows or abandoned burrows of large insects, whereas others excavate their burrows from the ground surface. Members of the Aurulentus Species Group prey on katydids (Tettigoniidae), those of the Pepticus and Distinctus Groups use grasshoppers (Acrididae), species of the Abdominalis Group prey upon grasshoppers, grouse locusts (Tetrigidae) and pygmy mole crickets (Tridactylidae), and the Mergus Group uses only pygmy mole crickets. Members of the extralimital Ambidens Group have been observed preying upon geometrid caterpillars.

Revision: Fox, 1892. Amer. Ent. Soc., Trans. 19: 234-252 (N. Amer. spp.). —Banks, 1942. Mus. Compar. Zool., Bul. 89: 395-436 (N. Amer. spp.).

Biology: Evans and Kurczewski, 1966. Kans. Ent. Soc., Jour. 39: 323-332, 3 figs. (comparative behavior of a few N. Amer. spp.).

### SPECIES GROUP AURULENTUS

This species group is the equivalent of *Tachytes* sens. str.

**auricomans** Bradley. Ga.

*Tachytes auricomans* Bradley, 1919. Ent. News 30: 298. ♂.

- aurulentus** (Fabricius). East. Canada and States south to Fla., north to N. J., west to Tex., Kans. Ecology: Nests in sand or clay with 2-4 cells per nest and 6-11 prey per cell. Prey: *Conocephalus saltans* (Scudd.), *C. spp.*, *Orchelimum fidicinum* Rehn and Heb., *O. spp.*, Tettigoniidae sp.; all nymphs.  
*Larra aurulenta* Fabricius, 1804. Systema Piezatorum, p. 220. ♀.  
*Tachytes mandibularis* Patton, 1881. Boston Soc. Nat. Hist., Proc. 20: 394. ♀, ♂.  
*Tachytes propinquus* Rohwer, 1909. Ent. News 20: 198. ♀.  
*Tachytes duplicatus* Rohwer, 1920. Ent. Soc. Wash., Proc. 22: 59. ♀.
- Taxonomy: Strandtmann, 1945. Ent. Soc. Amer., Ann. 38: 307, figs. 1-2 (larva). —Evans, 1958. Amer. Ent. Soc., Trans. 84: 117, figs. 18-20 (larva). —van der Vecht, 1961. Zool. Verhandl. Rijksmus. Natuurlijke Hist. Leiden, No. 48, pp. 11-12 (synonymy).
- Biology: Patton, 1892. Ent. News 3: 90 (prey). —Williams, 1914 (1913). Kans. Univ. Sci. Bul. 8: 198 (prey hunting). —Dow, 1930. Psyche 37: 182 (prey transport). —Strandtmann, 1945. Ent. Soc. Amer., Ann. 38: 305-308, figs. 1-4 (nest, prey, cocoon, life cycle). —Evans and Kurczewski, 1966. Kans. Ent. Soc., Jour. 329-330 (nest, prey).
- badius** Banks. Tex. (Comal Co.), Ariz. (Baboquivari Mts.).  
*Tachytes (Tachyplena) badius* Banks, 1942. Mus. Compar. Zool., Bul. 89: 417. ♀.
- columbiae** Fox. N. J., Md., Va., N. C.  
*Tachytes columbiae* Fox, 1892. Amer. Ent. Soc., Trans. 19: 241. ♀, ♂.
- crassus** Patton. Conn., Mass., N. Y., Md., Wis., Iowa, Mo., Nebr. Ecology: Nests in heavy clay-loam, constructs as many as 9 cells per nest, and stores 5-10 prey per cell. Prey: *Orchelimum gladiator* Brun., *O. spp.*, *Conocephalus f. fasciatus* (DeG.), *C. nigropleurus* (Brun.), *C. attenuatus* (Scudd.); most prey are nymphs but adults are occasionally stored.  
*Tachytes crassus* Patton, 1881. Boston Soc. Nat. Hist., Proc. 20: 241. ♀, ♂.
- Taxonomy: Evans, 1964. Amer. Ent. Soc., Trans. 90: 285-286, figs. 96-98 (larva).
- Biology: Krombein, 1961. Brooklyn Ent. Soc., Bul. 56: 64 (nest, prey transport). —Evans and Kurczewski, 1966. Kans. Ent. Soc., Jour. 39: 324-326, figs. 1-2 (nest, prey transport).
- ermineus** Banks. West. Tex., Ariz., south. Utah and Nev.; Mexico (Baja California).  
*Tachytes (Tachyplena) ermineus* Banks, 1942. Mus. Compar. Zool., Bul. 89: 413. ♀, ♂.
- exornatus** Fox. Southwest. Tex., N. Mex., Ariz.; Mexico (Baja California). Parasite: *Zanyssion t. texanus* (Cr.)? Prey: *Conalcea* sp.? nymph.  
*Tachytes exornatus* Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 501. ♂.
- Biology: Cockerell, 1903. Entomologist 36: 100 (parasite?). —Krombein, 1960. Brooklyn Ent. Soc., Bul. 55: 75 (prey transport).
- floridanus** Rohwer. N. C. to Fla., west to Ariz.  
*Tachytes pepticus floridanus* Rohwer, 1920. Ent. Soc. Wash., Proc. 22: 59. ♀.  
*Tachytes (Tachyplena) foxi* Banks, 1942. Mus. Compar. Zool., Bul. 89: 416. ♀.  
*Tachytes (Tachyplena) comanche* Banks, 1942. Mus. Compar. Zool., Bul. 89: 417. ♂.
- harpax** Patton. N. H., Mass., Conn., Pa., Va., N. C., Wis., Mich., Iowa, Nebr. Ecology: Nests in fine silt and sand, constructs several cells per nest and stores 2-3 prey per cell. Prey: *Conocephalus brevipennis* (Scudd.).  
*Tachytes harpax* Patton, 1881. Boston Soc. Nat. Hist., Proc. 20: 395. ♀, ♂.  
*Tachytes dubitatus* Rohwer, 1909. Ent. News 20: 202. ♀, ♂.
- Biology: Parker, 1921. Ent. Soc. Wash., Proc. 23: 103-104 (nest, prey transport).
- praedator** Fox. Md. to Fla., west to Iowa, Kans. and Tex. Ecology: Nests in fine-grained, somewhat moist sand, apparently makes only a single cell stored with up to 5 prey. Prey: *Scudderella* sp., *Conocephalus f. fasciatus* (DeG.), *C. sp.*, *Neoconocephalus* sp., *Eremopedes* sp.; usually nymphs are stored, but occasionally adults.  
*Tachytes praedator* Fox, 1892. Amer. Ent. Soc., Trans. 19: 240. ♀, ♂.

Biology: Evans and Kurczewski, 1966. Kans. Ent. Soc., Jour. 39: 330-331 (nest, prey transport). — Lin, 1967. Amer. Midland Nat. 77: 241-242, 1 fig. (nest, prey hunt and transport).

*sayi* Banks. U. S. west of 100th meridian, Nebr. to Wash. south to Tex. and cent. Calif.

Ecology: Nests in sandy soil. Prey: *Melanoplus lakinus* (Scudd.) adults.

*Tachytes (Tachytes) sayi* Banks, 1942. Mus. Compar. Zool., Bul. 89: 421. ♂, ♀.

*Tachytes (Tachytes) brevipilis* Banks, 1942. Mus. Compar. Zool., Bul. 89: 422. ♀.

*Tachytes (Tachytes) hesperus* Banks, 1942. Mus. Compar. Zool., Bul. 89: 423. ♀, ♂.

Biology: Evans and Kurczewski, 1966. Kans. Ent. Soc., Jour. 39: 331 (nest, prey).

*validus* Cresson. Ont. to Fla., west to Mich., Colo. and Tex. Ecology: Nests in sand, constructs 6 to more than 9 cells per nest and stores 1-5 prey per cell. Parasite: *Senotainia trilineata* (Wulp), *Miltogrammini* sp.; Diptera sp. Prey: *Conocephalus brevipennis* (Scudd.), *C. nigropleurum* (Brun.), *C. f. fasciatus* (DeG.), *C. spp.*; adults are preyed upon more frequently than nymphs.

*Tachytes validus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 216. ♀, ♂.

*Tachytes breviventrtris* Fox, 1892. Amer. Ent. Soc., Trans. 19: 239. ♀, ♂.

*Tachytes calcaratus* Fox, 1892. Amer. Ent. Soc., Trans. 19: 239. ♀, ♂.

*Tachytes calcaratiformis* Rohwer, 1909. Ent. News 20: 204. ♀, ♂.

*Tachytes (Tachyplena) calcaratiformis* var. *coloradensis* Banks, 1942. Mus. Compar. Zool., Bul. 89: 411. ♀, ♂.

*Tachytes (Tachyplena) belfragei* Banks, 1942. Mus. Compar. Zool., Bul. 89: 411. ♀.

*Tachytes quadrifasciatus* Dreisbach, 1948. Ent. News 59: 151. ♂.

Biology: Parker, 1921. Ent. Soc. Wash., Proc. 23: 104-107 (nest, prey transport, cocoon, life cycle, parasite). — Evans and Kurczewski, 1966. Kans. Ent. Soc., Jour. 39: 326-329 (nest, prey transport, parasite). — Kurczewski and Ginsburg, 1971. Kans. Ent. Soc., Jour. 44: 113-131, 9 figs. (nest, prey transport, egg, parasites). — Kurczewski and Kurczewski, 1971. Kans. Ent. Soc., Jour. 44: 132 (prey).

#### SPECIES GROUP PECTICUS

Revision: Bohart, 1962. Pan-Pacific Ent. 38: 117-129, 26 figs.

*californicus* Bohart. Calif., Oreg., Idaho.

*Tachytes californicus* Bohart, 1962. Pan-Pacific Ent. 38: 125, figs. 15-17. ♂, ♀.

*chelatus* Bohart. Ariz., Utah.

*Tachytes pepticus chelatus* Bohart, 1962. Pan-Pacific Ent. 38: 120, figs. 5, 6, 7. ♂, ♀.

*fulviventrtris fulviventrtris* Cresson. N. Dak. south to Tex., west to Wyo., Utah, N. Mex.; Mexico (Oaxaca). Ecology: Nests in deserted prairie-dog burrow. Parasite: Diptera sp. Prey: *Cordillacris crenulata* (Brun.) adults.

*Tachytes fulviventrtris* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 466. ♀.

*Tachytes caelebs* Patton, 1879. U. S. Geol. Geog. Survey, Bul. 5: 355. ♂.

Biology: Williams, 1914 (1913). Kans. Univ. Sci. Bul. 8: 197-198 (nest, prey, parasite).

*fulviventrtris rossi* Bohart. South. Calif.; Mexico (Baja California).

*Tachytes fulviventrtris rossi* Bohart, 1962. Pan-Pacific Ent. 38: 124, figs. 18-20. ♂.

*nevadensis* Bohart. Nev., Calif., Oreg., Wash.

*Tachytes nevadensis* Bohart, 1962. Pan-Pacific Ent. 38: 124, figs. 21-23. ♂, ♀.

*pennsylvanicus* Banks. N. Y. to Va. west to Idaho, Colo., N. Mex., Oreg., B. C.

*Tachytes pennsylvanicus* Banks, 1921. Ent. Soc. Amer., Ann. 14: 18. ♂.

*pepticus* (Say). N. C. to Fla. west to Ill., Kans., Nebr., Colo. and Tex. Prey: *Melanoplus* sp. nymph.

*Lyrops pepticus* Say, 1837. Boston Jour. Nat. Hist. 1: 371. ♀, ♂.

*Tachytes sericatus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 216. ♀ (male misdet.?).

*Tachytes (Tachytes) fulviventris* var. *inferioris* Banks, 1942. Mus. Compar. Zool., Bul. 89: 422. ♀.

*Tachytes (Tachytes) cressoni* Banks, 1942. Mus. Compar. Zool., Bul. 89: 425. ♀.

Biology: Evans and Kurczewski, 1966. Kans. Ent. Soc., Jour. 39: 331 (prey).

*sculleni* Bohart. Western Tex. to southern Calif., Nev.

*Tachytes sculleni* Bohart, 1962. Pan-Pacific Ent. 38: 126, figs. 8-11. ♂, ♀.

*spatulatus* Fox, Colo., N. Mex., Ariz., Utah, Nev., Wyo., Calif.

*Tachytes spatulatus* Fox, 1892. Amer. Ent. Soc., Trans. 19: 243. ♂.

*Tachytes basirufus* Rohwer, 1909. Ent. News 20: 197. ♂.

*Tachytes (Tachytes) utahensis* Banks, 1942. Mus. Compar. Zool., Bul. 89: 424. ♀, ♂.

#### SPECIES GROUP DISTINCTUS

*amazonus* Smith. N. C. to Fla., west to Nebr., Oreg. and Calif.; south through Cent. and South Amer. to Argentina. Prey: *Melanoplus* spp. adults and nymphs.

*Tachytes Amazonum* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 303. ♀, ♂.

*Tachytes clypeatus* Taschenberg, 1870. Ztschr. Gesell. Naturwiss. 36: 10. ♀.

*Tachytes scalaris* Taschenberg, 1870. Ztschr. Gesell. Naturwiss. 36: 11. ♂.

*Tachytes rufofasciatus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 247. ♂.

*Tachytes fervens* Smith, 1873. Ann. and Mag. Nat. Hist. (4) 12: 57. ♂.

*Tachytes dives* Holmberg, 1884. Soc. Cient. Argentina, An. 18: 220. ♂. Preocc.

*Tachysphex rufomaculatus* Cameron, 1889. Biol. Cent.-Amer., Hym., v. 2, p. 64, pl. 4, fig. 23. ♀.

*Tachytes Holmbergii* Dalla Torre, 1897. Cat. Hym., v. 8, p. 690. N. name.

*Tachytes nigricaudus* Brethes, 1909. Mus. Nac. Buenos Aires, An. (3) 12: 241. ♂.

*Tachytes Fiebrigi* Brethes, 1909. Mus. Nac. Buenos Aires, An. (3) 12: 242. ♂.

*Tachytes anisitsi* Strand, 1910. Zool. Jahrb., Abt. f. System., v. 29, h. 2, p. 164. ♀.

*Tachytes rufoannulatus* Strand, 1910. Zool. Jahrb., Abt. f. System., v. 29, h. 2, p. 167. ♂.

*Tachytes mimeticus* Schrottky, 1909. Soc. Cient. Argentina, An. 68: 250.

Biology: Williams, 1914 (1913). Kans. Univ. Sci. Studies 8: 199-200 (nest, prey hunt and transport).

*chrysocercus* Rohwer. South. Tex. and Ariz.; Mexico (Coahuila, Baja California). Parasite:

*Zanysson plesia* (Rohwer) ?

*Tachytes chrysocercus* Rohwer, 1911. U. S. Natl. Mus., Proc. 40: 581. ♀.

*Tachytes (Tachytes) elongatus* var. *apache* Banks, 1942. Mus. Compar. Zool., Bul. 89: 419. ♂.

Biology: Evans, 1966. Compar. ethology and evolution of sand wasps, p. 90 (host ?).

*distinctus distinctus* Smith. Md. to Fla., west to B. C. and Calif.; Mexico south to South America. Ecology: Nests in sandy soil and inside lizard holes, makes up to 20 cells per nest and stores 1-4 mostly immature prey per cell; also nests in abandoned burrows of the cicada killer, *Sphecius speciosus* (Dru.). Parasite: Diptera sp.; *Zanysson texanus* (Cr.) ? Prey: *Melanoplus femurrubrum* (DeG.), *M. spp.*, *Ageneotettix deorum* (Scudd.), *Orphulella* sp. near *speciosa* (Scudd.), *Schistocerca* sp., *Hesperotettix* sp., *Paraidemona* sp.; most prey is nymphal but occasionally adults are used. Another subsp. occurs in the Bahamas Islands.

*Larrada fulvipes* Smith, 1856. Cat. Hym., Brit. Mus., v. 4, p. 288. ♀.

*Tachytes distinctus* Smith, 1856. Cat. Hym., Brit. Mus., v. 4, p. 307. ♀.

*Tachytes elongatus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 215. ♂.

*Tachytes Yucatanensis* Cameron, 1889. Biol. Cent.-Amer., Hym., v. 2, p. 60, pl. 4, fig. 18. ♀.

*Tachytes contractus* Fox, 1892. Amer. Ent. Soc., Trans. 19: 245. ♀. Preocc.

*Tachytes (Tachytes) elongatus* var. *seminole* Banks, 1942. Mus. Compar. Zool., Bul. 89: 419. ♂.

*Tachytes (Tachytes) austrinus* Banks, 1942. Mus. Compar. Zool., Bul. 89: 419. N. name.

Taxonomy: Evans, 1958. Amer. Ent. Soc., Trans. 84: 116-117, figs. 9-17 (larva). — Evans, 1964. Amer. Ent. Soc., Trans. 90: 286-287 (larva).

Biology: Williams, 1914 (1913). Kans. Univ. Sci. Bul. 8: 194-197, figs. 113-116 (nest, prey hunt and transport). —Rau, 1934. Canad. Ent. 66: 260 (nest). —Evans, 1964. Amer. Ent. Soc., Trans. 90: 287 (nest, prey). —Lin, 1965. Brooklyn Ent. Soc., Bul. 59 and 60: 82-84, 1 fig. (nest). —Evans, 1966. Compar. ethology and evolution of sand wasps, pp. 89-90 (host ?). —Lin, 1972. In Michener and Lin, Quart. Rev. Biol. 47: 140-141 (nest guarding by males, parasite).

*guatemalensis* Cameron. East. U. S. to Guatemala.

*Tachytes guatemalensis* Cameron, 1889. Biol. Cent.-Amer., Hym., v. 2, p. 60, pl. 4, fig. 19. ♀.

*Liris coxalis* Patton, 1892. Ent. News 3: 90. ♀, ♂.

#### SPECIES GROUP ABDOMINALIS

This is the equivalent of the subgenus *Tachynana* Banks.

*abdominalis* (Say). Kans. Tex. to Ariz., Utah; Mexico. Prey: *Melanoplus* sp.; Tetrigidae sp.; all prey were nymphs.

*Larra abdominalis* Say, 1823. Western Quart. Rptr. 2: 77. ♀.

Biology: Williams, 1914 (1913). Kans. Univ. Sci. Bul. 8: 193 (nest, prey).

*birkmanni* Rohwer. Tex., Ariz.

*Tachytes birkmanni* Rohwer, 1909. Ent. News 20: 199. ♀.

*Tachytes (Tachynana) atomus* Banks, 1942. Mus. Compar. Zool., Bul. 89: 433. ♀.

*chrysopyga obscurus* Cresson. Md., Nebr. and Wash. south to Fla. and Ariz.; north. Mexico.

Prey: Acrididae sp. Typical *chrysopyga* (Spinola) and other subsp. occur in Mexico, West Indies, Central and South America.

*Tachytes obscurus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 217. ♀.

*Tachytes texanus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 217. ♂.

*Tachytes (Tachynana) hirsutifrons* Banks, 1942. Mus. Compar. Zool., Bul. 89: 430. ♂.

Biology: Williams, 1914 (1913). Kans. Univ. Sci. Bul. 8: 199 (prey).

*intermedius* (Viereck). N. Y. to Fla., west to Nebr. and Tex. Ecology: Nests in sand and may make only one cell per nest with several prey per cell. Prey: *Tridactylus apicalis* Say, *T. minutus* Scudd.; both nymphs and adults.

*Tachysphex intermedius* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 211. ♂.

*Tachytes minutus* Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 128. ♂.

*Tachytes maestus* Mickel, 1916. Amer. Ent. Soc., Trans. 42: 417. ♀.

*Tachytes austerus* Mickel, 1916. Amer. Ent. Soc., Trans. 42: 417. ♀.

*Tachytes (Tachynana) amicus* Banks, 1942. Mus. Compar. Zool., Bul. 89: 432. ♂.

Biology: Krombein and Kurczewski, 1963. Biol. Soc. Wash., Proc. 76: 146 (prey). —Krombein, 1963. Biol. Soc. Wash., Proc. 76: 273 (prey hunt). —Kurczewski, 1966. Kans. Ent. Soc., Jour. 39: 147-154, figs. 2, 5 (nest, prey hunt and transport). —Kurczewski and Kurczewski, 1971. Kans. Ent. Soc., Jour. 44: 132 (prey).

*obductus* Fox. N. Y. to Fla. west to Nebr. and Tex. Ecology: Nests in sand, constructs up to 6 cells per nest, and stores 3-7 prey per cell. Prey: *Tetrix o. ornata* (Say), Tetrigidae sp.; nymphs and adults.

*Tachytes obductus* Fox, 1892. Amer. Ent. Soc., Trans. 19: 250. ♀.

Biology: Williams, 1914 (1913). Kans. Univ. Sci. Studies 8: 198 (prey hunting and transport).

—Kurczewski and Kurczewski, 1971. Kans. Ent. Soc., Jour. 44: 133-134, 2 figs. (nest, prey).

*parvus* Fox. N. J. to Fla. west to Idaho and Calif. Prey: *Neotettix femoratus* (Scudd.) nymph.

*Tachytes parvus* Fox, 1892. Amer. Ent. Soc., Trans. 19: 249. ♂.

*Tachytes (Tachynana) pattoni* Banks, 1942. Mus. Compar. Zool., Bul. 89: 428. ♀.

*Tachytes (Tachynana) arizonicus* Banks, 1942. Mus. Compar. Zool., Bul. 89: 429. ♀.

Biology: Kurczewski and Kurczewski, 1971. Kans. Ent. Soc., Jour. 44: 134 (prey transport).

#### SPECIES GROUP MERGUS

This is the equivalent of *Tachyoides* Banks.

**mergus** Fox. N. J. to Fla. west to Nebr. and Ariz.; Mexico. Ecology: Nests in pure sand with high water table, constructs 1-3 cells per nest, and stores 6-13 small prey per cell.

Parasite: *Phrosinella fulvicornis* (Coq.). Prey: *Tridactylus apicalis* Say, *T. minutus* Scudd.; mostly nymphs but a few adults may be used.

*Tachytes mergus* Fox, 1892. Amer. Ent. Soc., Trans. 19: 250. ♀.

*Tachytes minor* Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 127. ♂.

*Tachytes obscuranus* Rohwer, 1909. Ent. News 20: 205. ♀, (♂ misdet.).

*Tachyoides ariella* Banks, 1942. Mus. Compar. Zool., Bul. 89: 434. ♀.

Taxonomy: Krombein, 1948. Brooklyn Ent. Soc., Bul. 43: 18-20. ♂. — Evans, 1964. Amer. Ent. Soc., Trans. 90: 287-288, figs. 85-87 (larva).

Biology: Krombein and Kurczewski, 1963. Biol. Soc. Wash., Proc. 76: 143-150, figs. 1-3 (nest, prey hunting and transport, egg, life cycle, parasites). — Kurczewski, 1966. Kans. Ent. Soc., Jour. 39: 147-154, figs. 1, 3, 4 (nest, prey hunt and transport).

### Genus TACHYSPHEX Kohl

*Tachysphex* Kohl, 1883. Deut. Ent. Ztschr. 27: 166.

Type-species: *Tachysphex filicornis* Kohl. Desig. by Bingham, 1897.

*Schistosphex* Arnold, 1922. Transvaal Mus., Ann. 9: 137.

Type-species: *Schistosphex Breijeri* Arnold. Orig. desig.

*Atelosphex* Arnold, 1923. Transvaal Mus., Ann. 9: 177.

Type-species: *Atelosphex miscophoides* Arnold. Orig. desig.

Members of this genus are ground-nesting and usually construct shallow, multicellular nests in which one or several prey are stored per cell. All authenticated prey records are for various kinds of Orthoptera including grasshoppers, mantids, cockroaches, crickets and katydids. In America north of Mexico members of the Pompiliformis and Terminatus Groups prey mostly upon Acrididae and occasionally use Tettigoniidae, one member of the Undatus Group uses Acrididae, two members of the Brullii Group use Blattidae or Tettigoniidae respectively, and one member of the Julliani Group uses Mantidae.

Revision: Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 504-533 (N. Amer. spp.).

Taxonomy: Kurczewski, 1971. Ent. Soc. Wash., Proc. 73: 113-114 (key to Fla. spp.).

Biology: Kurczewski, 1966. Kans. Ent. Soc., Jour. 39: 436-453, 9 figs. (comparative male behavior).

### SPECIES GROUP POMPILIFORMIS

**acutus** (Patton). East. States north to N. B., Ont., Man., west to S. Dak., Kans., south to N. C.

*Larra acuta* Patton, 1881. Boston Soc. Nat. Hist., Proc. 20: 390. ♀.

*Tachysphex bruesi* Rohwer, 1911. U. S. Natl. Mus., Proc. 40: 577. ♀.

**aethiops** (Cresson). West. States north to B. C., N. W. T. and Sask., south to Calif. and Colo.

Ecology: Constructs nest in sand off side of burrow of *Bembix*, up to 3 cells per nest, provides 1 prey per nest. Parasite: Diptera sp. Prey: *Trimerotropis suffusa* Scudd.?, *T. sp.*, Acrididae sp. Predator: *Philanthus pulcher* D. T., *P. zebratus nitens* (Bks.).

*Larrada aethiops* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 465. ♀.

Biology: Evans, 1970. Mus. Compar. Zool., Bul. 140: 489-490 (nest, prey, parasite). — Evans, 1973. Great Basin Nat. 33: 149-150 (nest, prey). — Alcock, 1973. Wasmann Jour. Biol. 31: 329, fig. 5 (nest, prey).

**amplus** Fox. West. States north to Oreg. and Wyo., south to Calif. and Tex.; Mexico (Zacatecas).

*Tachysphex amplus* Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 522. ♀, ♂.

*Tachysphex gillettei* Rohwer, 1911. U. S. Natl. Mus., Proc. 40: 571. ♀.

*Tachysphex neomexicanus* Rohwer, 1911. U. S. Natl. Mus., Proc. 40: 575. ♀.

**angularis** Mickel. Nebr. (Sioux Co.).

*Tachysphex angularis* Mickel, 1916. Amer. Ent. Soc., Trans. 42: 416. ♂.

- antennatus** Fox. Transcont., N. H., Mont. and Oreg., south to Va., La., Calif.; Mexico (Veracruz, Chiapas).  
*Tachysphex antennatus* Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 516. ♀.  
*Tachysphex sculptiloides* Williams, 1914 (1913). Kans. Univ. Sci. Bul. 8: 166. ♀. N. syn. (W. J. Pulawski).  
*Tachysphex nigrocaudatus* Williams, 1914 (1913). Kans. Univ. Sci. Bul. 8: 167. ♀, ♂. N. syn. (W. J. Pulawski).
- crassiformis** Viereck. N. C., Kans., Wyo., Calif. south to Fla., Tex., Ariz.; south through Mexico and Central America to Colombia and Venezuela. Ecology: Makes 1-celled nest in flat, loose sand, stores 1-3 prey per cell. Prey: *Psiniidia fenestralis* (Serv.), *Scirtetica marmorata picta* Scudd., Tryxalinae sp.; only nymphs have been reported as prey.  
*Tachysphex crassiformis* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 210. ♀.  
*Tachysphex wheeleri* Rohwer, 1911. U. S. Natl. Mus., Proc. 40: 579. ♀. N. syn. (W. J. Pulawski).  
*Tachysphex plenoculiformis* Williams, 1914 (1913). Kans. Univ. Sci. Bul. 8: 167. ♀. N. syn. (W. J. Pulawski).  
*Tachysphex boharti* Krombein, 1963. Ent. News 74: 177. ♀, ♂. N. syn. (W. J. Pulawski).  
*Tachysphex gibbus* Pulawski, 1974. Polskie Pismo Ent. 44: 20, figs. 9-17. N. syn. (W. J. Pulawski).
- Biology: Williams, 1914 (1913). Kans. Univ. Sci. Bul. 8: 201-202 (prey). — Krombein, 1963. Ent. News 74: 179-180 (nest, prey transport).
- crenulatus** Fox. N. Mex., Ariz., Calif.  
*Tachysphex crenulatus* Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 512. ♀.
- decorus** Fox. N. Dak.  
*Tachysphex decorus* Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 524. ♀.
- eldoradensis** Rohwer. Calif., Oreg., Wyo., Canad. Zone. Ecology: Occurs in openings in forests.  
*Tachysphex eldoradensis* Rohwer, 1917. U. S. Natl. Mus., Proc. 53: 245. ♀.
- erythraeus** Mickel. Nebr. (Sioux Co.).  
*Tachysphex erythraeus* Mickel, 1916. Amer. Ent. Soc., Trans. 42: 415. ♀.
- glabrior** Williams. Kans., Tex.; Mexico (Puebla, San Luis Potosi), El Salvador, Costa Rica, Venezuela.  
*Tachysphex glabrior* Williams, 1914 (1913). Kans. Univ. Sci. Bul. 8: 170. ♀, ♂.
- hurdi** Bohart. Oreg., Calif.; Mexico (Baja California).  
*Tachysphex hurdi* Bohart, 1962. Biol. Soc. Wash., Proc. 75: 33, figs. 13-15. ♂, ♀.
- krombeini** Kurczewski. Fla., Ga. Ecology: Makes 1-celled nest in flat sand and stores up to 7 prey. Prey: *Melanoplus* sp. nymphs; *Odontoxiphidium apterum* Morse nymph.  
*Tachysphex krombeini* Kurczewski, 1971. Ent. Soc. Wash., Proc. 73: 111, 1 fig. ♂, ♀.
- Biology: Kurczewski, 1971. Ent. Soc. Wash., Proc. 73: 115-116 (nest, prey hunt and transport, egg).
- laevifrons** (Smith). N. C., Fla., Kans., Tex. Ecology: Makes 1-celled nest in flat vegetated sand, stores 1 or a few larger prey. Prey: *Melanoplus* sp. nymphs.  
*Larrada laevifrons* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 291. ♀.  
*Tachysphex leensis* Rohwer, 1911. U. S. Natl. Mus., Proc. 40: 578. ♀. N. syn. (W. J. Pulawski).  
*Tachysphex consimiloides* Williams, 1914 (1913). Kans. Univ. Sci. Bul. 8: 164. ♀. N. syn. (W. J. Pulawski).
- Biology: Kurczewski, 1966. Kans. Ent. Soc., Jour. 39: 439 (male behavior). — Krombein, 1967. U. S. Dept. Agr., Monog. 2, Sup. 2, p. 393 (prey). — Kurczewski, 1971. Ent. Soc. Wash., Proc. 73: 114-116 (nest, prey).
- montanus** (Cresson). Mont., Wyo., Colo., Utah, Nev., Calif., B. C.  
*Larrada montana* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 465. ♀.  
*Tachysphex inusitatus* Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 524. ♂.  
*Tachysphex compactus* Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 528. ♂.  
*Tachysphex triquetrus* Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 528. ♀. N. syn. (W. J. Pulawski).



- parvulus** (Cresson). Colo., Wyo., Idaho, Oreg.; Canad. Zone. Ecology: Nests in sand bank with dense vegetation, 1 cell per nest, 1-2 prey per cell. Parasite: Miltogrammini sp. Prey: Acrididae spp.  
*Larrada parvula* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 465. ♂.  
*Tachysphex consimilis* Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 526. ♀, ♂.  
*Tachysphex agryrotrichus* Rohwer, 1911. U. S. Natl. Mus., Proc. 4: 572. ♂.
- Biology: Alcock, 1973. Wasmann Jour. Biol. 31: 329-331, fig. 9 (nest, prey capture and transport, parasite).
- pauxillus** Fox. B. C., Wash., Oreg., Idaho, Colo., Utah, Calif. Ecology: Nests in sand. Parasite: *Senotainia* sp. ? Prey: *Melanoplus* sp. nymph. Predator: *Philanthus pulcher* D. T.  
*Tachysphex pauxillus* Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 530. ♀.  
*Tachysphex nigrior* Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 530. ♀, ♂. N. syn. (W. J. Pulawski).
- Biology: Evans, 1970. Mus. Compar. Zool., Bul. 140: 490 (nest, prey, parasite, predator).
- pechumani** Krombein. N. Y., N. J., Mich. Ecology: Nests in sparsely vegetated pine barrens.  
*Tachysphex tarsatus pechumani* Krombein, 1938. Ent. Soc. Amer., Ann. 31: 468. ♀.
- Taxonomy: Kurczewski, Elliott and Vasey, 1970. Ent. Soc. Amer., Ann. 63: 1594-1597, 5 figs. ♀, ♂.
- powelli** Bohart. Calif.  
*Tachysphex powelli* Bohart, 1962. Biol. Soc. Wash., Proc. 75: 35, figs. 1-3. ♂, ♀.
- psilocerus** Kohl. Colo.; Mexico (Baja California, Durango, Mexico).  
*Tachysphex psilocerus* Kohl, 1884 (1883). Zool.-Bot. Gesell. Wien, Verhandl. 33: 374. ♀.  
*Tachysphex helianthi* Rohwer, 1911. U. S. Natl. Mus., Proc. 40: 570. ♀. N. syn. (W. J. Pulawski).  
*Tachysphex nitelopteroides* Williams, 1958. Pan-Pacific Ent. 34: 207, fig. 1. ♀, ♂. N. syn. (W. J. Pulawski).
- punctifrons** (Fox). U. S. east of Rocky Mts., north to Mich. and N. Y. Prey: *Melanoplus* sp. probably *bivittatus* (Say).  
*Larra punctifrons* Fox, 1891. Ent. News 2: 194. ♀.  
*Tachysphex fedorensis* Rohwer, 1911. U. S. Natl. Mus., Proc. 40: 576. ♀, ♂.
- quebecensis** (Provancher). Que., Ont., Alta., N. W. T., Maine, Mass.  
*Larra quebecensis* Provancher, 1882. Nat. Canad. 13: 150. ♀, ♂.  
*Larra abdominalis* Provancher, 1887. Addit. Corr. Faune Ent. Canada Hym., p. 266. Lapsus.
- sculptilis** Fox. Nebr. (Blaine Co.), Colo., Ariz., Nev., Calif.; montane.  
*Tachysphex asperatus* Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 516. ♀. N. syn. (W. J. Pulawski).  
*Tachysphex sculptilis* Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 517. ♀.  
*Tachysphex nigrescens* Rohwer, 1908. Ent. News 19: 220. ♀. N. syn. (W. J. Pulawski).  
*Tachysphex sphecodoides* Rohwer, 1911. U. S. Natl. Mus., Proc. 40: 578. ♀.
- semirufus** (Cresson). Yukon to Calif., east to Ont., Wyo., Colo., Ariz. Prey: *Melanoplus spretus* (Walsh), young nymphs.  
*Larrada semirufa* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 464. ♀.  
*Tachysphex punctulatus* Smith, 1906. Ent. News 17: 246. ♀. Preocc.  
*Tachysphex puncticeps* Smith, 1908. Nebr. Univ., Studies 8: 381. N. name.  
*Tachysphex giffardi* Rohwer, 1917. U. S. Natl. Mus., Proc. 53: 244. ♀.
- Biology: Riley, 1878. U. S. Dept. Agr., Ent. Comn. Rpt. 1: 317 (prey).
- sonorensis** (Cameron). U. S. west of 100 degrees; Mexico (Baja California, Sonora, Chihuahua, Puebla).  
*Larra sonorensis* Cameron, 1889. Biol. Cent.-Amer., Hym., v. 2, p. 50. ♀.  
*Tachysphex dakotensis* Rohwer, 1923. Ent. Soc. Wash., Proc. 25: 98. ♀. N. syn. (W. J. Pulawski).  
*Tachysphex schlingeri* Bohart, 1962. Biol. Soc. Wash., Proc. 75: 36, figs. 4-6. ♂, ♀. N. syn. (W. J. Pulawski).

- tarsatus** (Say). Transcont. in U. S., Canad., Transit., and Austr. Zones.; Mexico (Baja California, Jalisco). Ecology: Makes unicellular nest in a variety of vegetated, sandy soils. Parasite: Diptera sp. Prey: *Melanoplus* spp., *Trimerotropis* sp. ?; only nymphs have been reported as prey.  
*Larva tarsata* Say, 1823. Western Quart. Rptr. 2: 78. ♀.  
*Tachysphex dubius* Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 515. ♂. Preocc.  
*Tachysphex dubiosus* Dalla Torre, 1897. Cat. Hym., v. 8, p. 679. N. name.  
*Tachysphex hitei* Rohwer, 1908. Ent. News 19: 221. ♀.  
*Tachysphex sanguinosus* Mickel, 1916. Amer. Ent. Soc., Trans. 42: 414. ♀. N. syn. (W. J. Pulawski).  
*Tachysphex zimmeri* Mickel, 1916. Amer. Ent. Soc., Trans. 42: 415. ♀.
- Biology: Riley, 1880. U. S. Dept. Agr., Ent. Comn. Rpt. 2: 270-271 (prey). —Peckham and Peckham, 1900. Wis. Nat. Hist. Soc., Bul. 1: 89-90 (nest, prey transport). —Williams, 1914 (1913). Kans. Univ. Sci. Bul. 17: 203-206, fig. 117 (nest, prey hunt and transport). —Kurczewski, 1966. Kans. Ent. Soc., Jour. 39: 439 (nest). —Evans, 1970. Mus. Compar. Zool., Bul. 140: 490 (prey transport, nest). —Alcock and Gamboa, 1975. Ariz. Acad. Sci., Jour. 10: 164 (nest, prey).
- tenuipunctus** Fox. West. Canada and U. S. in mountains south to Ariz., N. Mex. Ecology: Makes unicellular nest in sandy rangeland, stores 1-2 prey. Parasite: *Taxigramma heteroneura* (Meig.); *Sphaerophthalma orestes* (Fox). Prey: *Oedaleonotus enigma* (Scudd.), *Aulocara elliotti* (Thom.), *Melanoplus* sp.; only nymphs have been recorded as prey.  
*Tachysphex tenuipunctus* Fox, 1894 (1893). Acad. Nat. Sci., Phila., Proc. 45: 525. ♀.  
*Tachysphex granulatus* Mickel, 1916. Amer. Ent. Soc., Trans. 42: 413. ♀.
- Biology: Newton, 1956. Jour. Econ. Ent. 49: 615-619 (nest, prey hunt and transport, life cycle, egg, larva, cocoon, parasite).
- texanus** (Cresson). Transcont., north to N. Y., Mich., Mont., south to Fla., Tex., Ariz., Calif.; Mexico (Jalisco). Prey: Oedipodinae sp. nymph.  
*Larada texana* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 214. ♀, ♂.  
*Tachysphex sepulcralis* Williams, 1914 (1913). Kans. Univ. Sci. Bul. 8: 169. ♀, ♂. N. syn. (W. J. Pulawski).  
*Tachysphex maneei* Banks, 1921. Ent. Soc. Amer., Ann. 14: 19. ♀. N. syn. (W. J. Pulawski).
- Biology: Williams, 1914 (1913). Kans. Univ. Sci. Bul. 8: 206 (prey).
- williamsi** Bohart. Calif. (San Francisco Co.).  
*Tachysphex williamsi* Bohart, 1962. Biol. Soc. Wash., Proc. 75: 38, figs. 10-12. ♂, ♀.
- SPECIES GROUP TERMINATUS
- alpestris** Rohwer. N. W. T., Alta., B. C. to Calif., eastwards to Wyo., Nebr., Colo. and N. Mex., south to Costa Rica.  
*Tachysphex foxii* var. *alpestris* Rohwer, 1908. Ent. News 19: 233. ♀.
- apicalis apicalis** Fox, n. status (W. J. Pulawski). D. C., N. C., Ga., Fla. Ecology: Makes multicellular nests with up to 7 prey per cell in open sand, frequently in sand cliffs. Prey: *Melanoplus* sp. possibly *puer* (Scudd.) nymph, Acrididae sp.  
*Tachysphex apicalis* Fox, 1893. N. Y. Ent. Soc., Jour. 1: 53. ♀, ♂.  
*Tachysphex fumipennis* Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 518. ♀.
- Taxonomy: Evans, 1964. Amer. Ent. Soc., Trans. 90: 288-289, figs. 99-103 (larva).
- Biology: Krombein, 1964. Amer. Mus. Novitates 2201: 15 (nest, prey transport, egg). —Kurczewski, 1966. Kans. Ent. Soc., Jour. 39: 436-453, figs. 2, 3, 5, 6b, 8, 9 (nest, male behavior). —Kurczewski and Snyder, 1968. Conservationist 23 (2): 30-31, 6 figs. (nest, prey).
- apicalis fusus** Fox, n. status (W. J. Pulawski). Transcont. except southeast. U. S., north to Md., Ky., N. Dak., Wash., south to Central America; introduced into Hawaii. Ecology: Nests in mortar between foundation rocks, in abandoned insect burrows in ground, in earthen bank and sand cliffs, stores several prey per cell in multicellular nests. Prey:

*Melanoplus* sp., *Chortophaga* sp., *Oxya* sp. ?, Tryxalinae sp.; only nymphs are used so far as recorded.

*Tachysphex fusus* Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 519. ♀, ♂.

*Tachysphex foxii* Rohwer, 1908. Ent. News 19: 222. ♀.

Biology: Williams, 1914 (1913). Kans. Univ. Sci. Bul. 8: 201 (prey, nest). —Rau and Rau, 1918. Wasp Studies Afield, pp. 149-150 (nest). —Kurczewski and Snyder, 1968. Conservationist 23 (2): 30-31 (nest, prey).

*clarconis* Viereck. Western States north to B. C., Wash. and Wyo., south to Calif. and N. Mex.

*Tachysphex clarconis* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 211. ♀.

*Tachysphex plesia* Rohwer, 1917. U. S. Natl. Mus., Proc. 53: 245. ♀. N. syn. (W. J. Pulawski).

*linsleyi* Bohart. Western States north to Idaho and Wyo., eastwards to Colo. and Tex., south to Calif.; Mexico. Prey: Acrididae sp. nymph.

*Tachysphex linsleyi* Bohart, 1962. Biol. Soc. Wash., Proc. 75: 35, figs. 7-9. ♂, ♀.

Biology: Krombein, 1967. U. S. Dept. Agr., Monog. 2, Sup. 2, p. 393 (prey).

*similis* Rohwer. North to N. B. and Sask., west to Alta., Utah, N. Mex.; Mexico. Ecology:

Nests in open sand, makes multicellular nest, stores 4-10 prey per cell. Parasite:

*Hedychridium fletcheri* Bod. Prey: *Radnotatum* sp., *Atenopedes* sp., *Schistocerca* sp., *Melanoplus* sp.; only nymphs have been recorded as prey.

*Tachysphex similis* Rohwer, 1910. Ent. Soc. Wash., Proc. 12: 51. ♀, ♂.

*Tachysphex similans* Rohwer, 1910. Ent. Soc. Wash., Proc. 12: 52. ♀.

Taxonomy: Elliott and Kurczewski, 1974. Ent. Soc. Amer., Ann. 67: 725-727, 2 figs. (character displacement).

Biology: Krombein and Evans, 1955. Ent. Soc. Wash., Proc. 57: 231 (prey transport).

—Krombein, 1964. Amer. Mus. Novitates 2201: 15-17, fig. 1 (nest, prey transport, egg).

—Kurczewski, 1966. Kans. Ent. Soc., Jour. 39: 436-453, fig. 4 (nest, male behavior).

—Kurczewski, 1967. Kans. Ent. Soc., Jour. 40: 278-284 (parasite).

*terminatus* (Smith). Transcont. except Fla. and Pacific States, north to P. E. I., Que., Ont.,

Man., Sask., N. W. T., south to Colombia and north. Brazil. Parasite: *Anthrax a. albofasciatus* Macq.; *Phrosinella fulvicornis* (Coq.), *Senotainia trilineata* (Wulp). Prey:

*Phaneroptera* spp.; *Chortophaga viridifasciata* DeG., *Chloealetis conspersa* Harr., *Chorthippus curtipennis* (Harr.), *Dissosteira carolina* (L.), *Pardalophora apiculata*

Harr. ?, *Melanoplus bivittatus* (Say), *M. femurrubrum* (DeG.), *M. keeleri* *luridus* (Dodge), *M. spp.*, *Tryxalus* spp., Tryxalinae sp., *Syrbula admirabilis* Uhl.,

*Dichromorpha viridis* Scudd.; all recorded prey were nymphs.

*Larada terminata* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 291. ♂.

*Larra minor* Provancher, 1887. Addit. Corr. Faune Ent. Canada Hym., p. 268. ♀, ♂.

Taxonomy: Evans, 1958. Amer. Ent. Soc., Trans. 84: 118, figs. 21-28 (larva). —Elliott and Kurczewski, 1974. Ent. Soc. Amer., Ann. 67: 725-727, 2 figs. (character displacement).

Biology: Ashmead, 1894. Psyche 7: 63 (prey). —Williams, 1914 (1913). Kans. Univ. Sci. Bul. 8: 201 (prey). —Rau and Rau, 1918. Wasp Studies Afield, pp. 144-149 (nest, prey transport).

—Rau, 1927. Acad. Sci. St. Louis, Trans. 25: 188-190 (nest, prey, life cycle). —Rau, 1946.

Brooklyn Ent. Soc., Bul. 41: 10. —Strandtmann, 1953. Kans. Ent. Soc., Jour. 26: 49-51, fig. 2

(nest, prey transport, life cycle). —Kurczewski, 1966. Kans. Ent. Soc., Jour. 39: 317-322, 1

fig. (nest, prey transport). —Kurczewski, 1966. Kans. Ent. Soc., Jour. 39: 436-453, figs. 1,

6a, 7 (nest, male behavior, mating). —Kurczewski and Harris, 1968. N. Y. Ent. Soc., Jour.

76: 81-83 (parasites, nest). —Kurczewski and Snyder, 1968. Conservationist 23 (2): 28-31, 5

figs. (nest, prey, life cycle, parasite). —Evans, 1970. Mus. Compar. Zool., Bul. 140: 491

(nest, prey).

#### SPECIES GROUP UNDATUS

*ashmeadii* Fox. Oreg. to Calif., east to centr. Tex., Kans. and Wyo. in deserts. Ecology: Nests in sand. Prey: *Metator* sp. nymph, *Cordillacris crenulata* (Brun.) adult, *Trachyrhachys*

*kiowa* (Thom.) adult, *Opeia* sp. nymph, *Phlibostroma* sp. adult.

*Tachysphex ashmeadii* Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 509. ♀.

- Tachysphex posterus* Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 510. ♀.  
*Tachysphex spinosus* Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 511. ♀.  
*Tachysphex spissatus* Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 515. ♂.  
*Larra rufipes* Provancher, 1895. Nat. Canad. 22: 129. ♀.  
*Tachysphex propinquus* Viereck, 1904. Ent. News 15: 85. ♀. N. syn. (W. J. Pulawski).

Biology: Williams, 1914 (1913). Kans. Univ. Sci. Studies 8: 202-203, fig. 112 (nest, prey hunt and transport). —Krombein, 1967. U. S. Dept. Agr., Monog. 2, Sup. 2, pp. 392-393 (prey). —Alcock and Gamboa, 1975. Ariz. Acad. Sci., Jour. 10: 164 (nest, prey).

## SPECIES GROUP BRULLII

**alayoi** Pulawski. Fla. (Dania in Broward Co.); West Indies, Cuba to Virgin Islands. Prey:

Blattidae sp. nymph.

*Tachysphex alayoi* Pulawski, 1974. Polskie Pismo Ent. 44: 84, figs. 121-128. ♀, ♂.

Biology: Pulawski, 1974. Polskie Pismo Ent. 44: 87 (prey).

**belfragei** (Cresson). D. C. to Fla. west to Iowa, Nebr., Tex. Prey: *Conocephalus* sp. nymphs.

*Larrada belfragei* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 215. ♀.

*Tachytes minimus* Fox, 1892. Amer. Ent. Soc., Trans. 19: 248. ♀.

Biology: Krombein, 1967. U. S. Dept. Agr., Monog. 2, Sup. 2, p. 392 (prey).

**maurus** Rohwer. Tex. to Ariz.; Mexico (Sonora).

*Tachysphex maurus* Rohwer, 1911. U. S. Natl. Mus., Proc. 40: 575. ♀, ♂.

**mundus** Fox. Transcontinental, north to south. Canada, south to Mexico (Chiapas).

*Larra rufitarsis* Cameron, 1889. Biol. Cent.-Amer., Hym., v. 2, p. 50, pl. 4, fig. 11. ♂.

Preocc. N. syn. (W. J. Pulawski).

*Tachysphex aequalis* Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 517. ♂. N. syn. (W. J. Pulawski).

*Tachysphex ersectus* Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 526. ♀ (♂ misdet.). N. syn. (W. J. Pulawski).

*Tachysphex mundus* Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 531. ♀, ♂.

*Tachysphex johnsoni* Rohwer, 1911. U. S. Natl. Mus., Proc. 40: 573. ♀. N. syn. (W. J. Pulawski).

*Tachysphex opwanus* Rohwer, 1911. U. S. Natl. Mus., Proc. 40: 574. ♂. N. syn. (W. J. Pulawski).

*Tachysphex robustior* Williams, 1914 (1913). Kans. Univ. Sci. Bul. 8: 164. ♂. N. syn. (W. J. Pulawski).

*Tachysphex crenuloides* Williams, 1914 (1913). Kans. Univ. Sci. Bul. 8: 168. ♀. N. syn. (W. J. Pulawski).

*Tachysphex washingtoni* Rohwer, 1917. U. S. Natl. Mus., Proc. 53: 172. ♀. N. syn. (W. J. Pulawski).

## SPECIES GROUP JULLIANI

**cockerellae** Rohwer. Calif., Nev., Ariz.; Mexico south to Colombia.

*Tachysphex cockerellae* Rohwer 1914. U. S. Natl. Mus., Proc. 47: 518. ♂.

**coquilletti** Rohwer. Kans., Okla., Colo., N. Mex., Ariz., Nev., Calif.; Mexico (Baja California, Durango, Zacatecas). Prey: *Litaneutria minor* (Scudd.), *L.* sp., nymph.

*Tachysphex coquilletti* Rohwer, 1911. U. S. Natl. Mus., Proc. 40: 572. ♀, ♂.

*Tachysphex dentatus* Williams, 1914 (1913). Kans. Univ. Sci. Bul. 8: 169. ♀.

Biology: Kurczewski, 1966. Kans. Ent. Soc., Jour. 39: 317 (prey). —Krombein, 1967. U. S. Dept. Agr., Monog. 2, Sup. 2, p. 393 (prey). —Alcock and Gamboa, 1975. Ariz. Acad. Sci., Jour. 10: 164-165 (nest, orientation flight, prey).

## Genus PROSOPIGASTRA Costa

*Prosopigastra* Costa, 1867. Mus. Zool. Napoli Ann. 4: 88.

Type-species: *Prosopigastra punctatissima* Costa. Monotypic.

*Homogambrus* Kohl, 1889. K. K. Naturhist. Hofmus., Ann. 4: 191.

Type-species: *Tachysphex globiceps* Morawitz. Monotypic.

*Hologambrus* Morice, 1897. Ent. Soc. London, Trans., p. 309. Lapsus or emend.

Three Old World species make multicellular nests in soil, and two of them utilize pre-existing burrows of other insects. Prey consists of Hemiptera and Homoptera belonging to the families Lygaeidae, Tropicuchidae or Pentatomidae.

*nearctica* Bohart. Calif., Ariz.

*Prosopigastra nearctica* Bohart, 1958. Ent. Soc. Wash., Proc. 60: 122, 6 figs. ♂, ♀.

#### SUBFAMILY MISOPHINAE

Two inadequate revisions are listed under the heading Subfamily Larrinae.

#### Genus LYRODA Say

*Lyrops* subg. *Lyroda* Say, 1837. Boston Jour. Nat. Hist. 1: 372.

Type-species: *Lyrops (Lyroda) subita* Say. Desig. by Patton, 1881.

*Morphota* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 293.

Type-species: *Morphota fasciata* Smith. Desig. by Pate, 1937.

*Odontolarra* Cameron, 1900. Ann. and Mag. Nat. Hist. (7) 5: 35.

Type-species: *Odontolarra rufiventris* Cameron. Monotypic.

*Lyrodon* Howard, 1901. Insect Book, pl. 6, fig. 5. Lapsus. Preocc.

These wasps are ground-nesting and may utilize pre-existing burrows or cavities. One North American species preys upon crickets (Gryllidae) and several extralimital species use grouse locusts (Tetrigidae).

*subita* (Say). Transcont. in south Canada and U. S. Ecology: Nests in pre-existing burrows or cavities, makes up to 2 cells per nest and stores up to 9 prey per cell. Parasite: *Metopia argyrocephala* (Meig.). Prey: *Nemobius carolinus* Scudd., *N. fasciatus* (DeG.), *N. spp.*; nymphs.

*Lyrops (Lyroda) subita* Say, 1837. Boston Jour. Nat. Hist. 1: 372. ♀.

*Larrada arcuata* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 293. ♀.

*Lyroda cockerelli* Rohwer, 1909. Ent. News 20: 369. ♂.

Taxonomy: Evans, 1964. Amer. Ent. Soc., Trans. 90: 281-282, figs. 78-84 (larva).

Biology: Patton, 1892. Ent. News 3: 90 (prey transport). —Peckham and Peckham, 1898. Wis.

Geol. Nat. Hist. Survey, Bul. 2: 169-171 (nest, prey transport, life cycle). —Peckham and

Peckham, 1905. Wasps, Social and Solitary, pp. 253-256 (nest, prey transport, life cycle).

—Evans, 1964. Amer. Ent. Soc., Trans. 90: 282 (nest, prey transport, parasite).

—Kurczewski and Kurczewski, 1971. Kans. Ent. Soc., Jour. 44: 132 (prey).

*triloba* (Say). Canada, D. C., Ill., Ind., Kans., La., Tex.

*Lyrops (Lyroda) triloba* Say, 1837. Boston Jour. Nat. Hist. 1: 372. ♀.

*Lyrops (Lyroda) caliptera* Say, 1837. Boston Jour. Nat. Hist. 1: 373. Lapsus.

#### Genus PLENOCULUS Fox

*Plenoculus* Fox, 1893. Psyche 6: 554.

Type-species: *Plenoculus davisi* Fox. Monotypic.

*Ptygosphex* Gussakovskij, 1928. Inst. Zool. Appl. Phytopath., Leningrad, Bul. 4: 18.

Misspelled *Ptygosphex* in generic heading.

Type-species: *Ptygosphex murgabensis* Gussakovskij. Orig. desig.

*Pavlovskia* Gussakovskij, 1935. Trav. Fil. Acad. Sci. URSS, Tadjikistan 5: 424.

Type-species: *Pavlovskia tadjihika* Gussakovskij. Orig. desig.

These wasps nest in sand and construct 1- or multicelled nests. In North America several taxa prey upon Hemiptera or Homoptera but one species uses pyralidid caterpillars as prey.

Revision: Williams, 1960. Calif. Acad. Sci., Proc. (4) 31: 1-49, 90 figs. (N. Amer. spp.).

Taxonomy: Ashmead, 1899. Psyche 8: 337-338 (key to some N. Amer. spp.).

*boharti* Williams. Southern Calif.

*Plenoculus boharti* Williams, 1960. Calif. Acad. Sci., Proc. (4) 31: 28, figs. 40, 61, 83, 84. ♀, ♂.

**boregensis boregensis** Williams. Calif. (Borego in San Diego Co.).

*Plenoculus boregensis boregensis* Williams, 1960. Calif. Acad. Sci., Proc. (4) 31: 20, figs. 26-29. ♀, ♂.

**boregensis perniger** Williams. Calif. (Thousand Palms).

*Plenoculus boregensis perniger* Williams, 1960. Calif. Acad. Sci., Proc. (4) 31: 21. ♂.

**cockerellii** Fox. Southern Calif. to western Tex.; Mexico (Baja California, Guerrero). Ecology: Nests in sand. Prey: Pyralididae spp. larvae.

*Plenoculus Cockerellii* Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc., 45: 538. ♀.

Biology: Williams, 1960. Calif. Acad. Sci., Proc. (4) 31: 46-47 (nest, prey transport).

**cuneatus** Williams. Southern Calif. and Nev.

*Plenoculus cuneatus* Williams, 1960. Calif. Acad. Sci., Proc. (4) 31: 12, figs. 10, 17, 18, 24, 25. ♀, ♂.

**davisi atlanticus** Viereck. Coastal Conn. to Fla., Tex. Ecology: Nests in open sand, provides up to 7 prey per cell. Prey: *Phytocoris* sp. nymphs and adult.

*Plenoculus atlanticus* Viereck, 1902. Ent. News 13: 74. ♂.

Taxonomy: Krombein, 1955. Ent. Soc. Wash., Proc. 57: 146.

Biology: Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 181, 191, 192, 194-199, 202, 205 (nest, prey transport, egg).

**davisi davisi** Fox. Conn. to Fla. west to Alaska, B. C., Idaho and Calif.; Mexico (Baja California, Sinaloa, Nayarit, Durango). Ecology: Nests in sand, constructs 1-4 cells per nest and stores 2-24 prey per cell. Prey: *Arhyssus lateralis* (Say) adult; Aphidae sp.

immature; *Adelphocoris rapidus* (Say), *Amblytylus nasutus* (Kirschb.), *Campylomma verbasci* (Meyer), *Chlamydatus associatus* (Uhl.), *Collaria* sp. ?, *Halticus bracteatus* (Say), *Lopidea robiniae* (Uhl.), *Lygus lineolaris* (Beauv.), *Neolygus* sp. ?, *Orthocephalus mutabilis* (Fall.), *Orthotylus chorionis* (Say), *O. marginatus* (Uhl.), *O. quercicola* Knight, *O. sp.*, *Pilophorus amoenus* Uhl., *P. sp.*, *Plagiognathus chrysanthemi* (Wolff), *P. politus* Uhl., *P. sp.*, *Poecilocapsus lineatus* (F.), *Psallus seriatus* Reut. ?, *Stenotus binotatus* (F.), *Trigonotylus ruficornis* (Geoff.), *T. sp.*, Mirinae spp., Phylini spp.; adults are stored more commonly than nymphs. Predator: *Philanthus pulcher* D. T., *P. crabroniformis* Sm.

*Plenoculus davisi* Fox, 1893. Psyche 6: 554. ♀, ♂.

*Plenoculus abdominalis* Ashmead, 1899. Psyche 8: 339. ♂.

*Plenoculus apicalis* Williams, 1914 (1913). Kans. Univ. Sci. Bul. 8: 175. ♀, ♂.

Taxonomy: Evans, 1959. Amer. Ent. Soc., Trans. 85: 166-167, figs. 54-59 (larva).

Biology: Williams, 1914 (1913). Kans. Univ. Sci. Bul. 8: 207-208, fig. 120 (nest, prey transport).

—Williams, 1960. Calif. Acad. Sci., Proc. (4) 31: 46 (prey). —Evans, 1961. Ent. News 72: 223-228 (nest, prey transport, life cycle). —Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 179-207, 20 figs. (nest, prey transport, egg). —Evans, 1970. Mus. Compar. Zool., Bul. 140: 488 (nest, prey, predator).

**davisi gracilis** Williams. Calif. (Riverside Co.).

*Plenoculus davisi gracilis* Williams, 1960. Calif. Acad. Sci., Proc. (4) 31: 42, fig. 54. ♀.

**davisi mojaviensis** Williams. Southern Calif., Ariz., N. Mex.

*Plenoculus davisi mojaviensis* Williams, 1960. Calif. Acad. Sci., Proc. (4) 31: 39, figs. 86, 88. ♀, ♂.

**davisi transversus** Williams. Calif. (Tulare and Riverside Counties).

*Plenoculus davisi transversus* Williams, 1960. Calif. Acad. Sci., Proc. (4) 31: 40, figs. 8, 57, 59. ♀.

**deserti** Williams. Southern Calif.

*Plenoculus deserti* Williams, 1960. Calif. Acad. Sci., Proc. (4) 31: 26, figs. 85, 87. ♂, ♀.

**gillaspys** Krombein. Tex. (Williamson Co.).

*Plenoculus gillaspys* Krombein, 1938. Ent. Soc. Amer., Ann. 31: 468. ♀.

**palmarum** Williams. Southern Calif.

*Plenoculus palmarum* Williams, 1960. Calif. Acad. Sci., Proc. (4) 31: 22, figs. 9, 36, 37, 71, 73, 78. ♂, ♀.

*parvus* Fox. N. Mex. (Las Cruces).

*Plenoculus parvus* Fox, 1897. Ent. News 8: 71. ♀.

*propinquus* Fox. Wash. to Calif. east to Idaho, Colo., N. Mex. Ecology: Nests in open sand.

Prey: *Lygus desertus* Knight, Miridae sp.; adults.

*Plenoculus propinquus* Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 537. ♀.

*Plenoculus propinquus* var. *rufescens* Cockerell, 1898. Davenport Acad. Sci., Proc. 7: 144.

Biology: Kurczewski, 1968. Kans. Ent. Soc., Jour. 41: 181, 191, 197, 198, 202 (nest, prey transport, egg). — Evans, 1970. Mus. Compar. Zool., Bul. 140: 488 (nest, prey).

*sinuatus* Williams. Southern Calif.

*Plenoculus sinuatus* Williams, 1960. Calif. Acad. Sci., Proc. (4) 31: 7, figs. 30, 32, 35. ♀, ♂.

*stygius* Williams. Southern Calif. and Ariz. Prey: Miridae sp.

*Plenoculus stygius* Williams, 1960. Calif. Acad. Sci., Proc. (4) 31: 31, figs. 5, 62, 90. ♀, ♂.

Biology: Williams, 1960. Calif. Acad. Sci., Proc. (4) 31: 46 (prey).

*timberlakei* Williams. Southern Calif. and Ariz.

*Plenoculus timberlakei* Williams, 1960. Calif. Acad. Sci., Proc. (4) 31: 11, figs. 2, 11, 19-22, 31, 38, 47, 49, 52, 77. ♀, ♂.

### Genus SOLIERELLA Spinola

*Solierella* Spinola, 1851. In Gay, Hist. Fis. Pol. Chile, Zool., v. 6, p. 349.

Type-species: *Solierella miscophoides* Spinola. Monotypic.

*Silaon* Piccioli, 1869. Soc. Ent. Ital., Bol. 1: 282.

Type-species: *Silaon compedita* Piccioli. Monotypic.

*Sylaon* Piccioli, 1870. Soc. Ent. Ital., Bol. 2: pl. 1. Lapsus or emend.

*Niteliopsis* Saunders, 1873. Ent. Soc. London, Trans., p. 410.

Type-species: *Niteliopsis pisonoides* Saunders. Monotypic.

*Ammosphacidium* Kohl, 1878. Zool.-Bot. Gesell. Wien, Verh. 27: 701.

Type-species: *Ammosphacidium Helli* Kohl. Monotypic.

*Sylaon* Kohl, 1885. Zool.-Bot. Gesell. Wien, Verh. 34: 290. Emend. or lapsus.

*Lautara* Herbst. 1920. Mus. Nac. Chile, Bol. 11: 217.

Type-species: *Lautara Jaffueli* Herbst. Monotypic.

Our species usually build multicelled nests in pre-existing cavities in lumber, twigs, stems, galls, nut hulls, or in abandoned burrows in the ground. The prey of some North American species has been recorded as Hemiptera of several families, Acrididae and Psocoptera.

Revision: Williams, 1950. Calif. Acad. Sci., Proc. (4) 26: 355-417 (Calif. spp.).

Taxonomy: Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 108-110 (key to some spp.).

*abdominalis* Williams. Calif.

*Solierella abdominalis* Williams, 1950. Calif. Acad. Sci., Proc. (4) 26: 381. ♀, ♂.

*affinis* (Rohwer). Kans., Colo., Wyo., Idaho, Calif. Ecology: Nests in soil, possibly in pre-existing burrows, stores 4 or more prey per cell. Prey: *Nabis* sp. nymphs.

*Niteliopsis affinis* Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 113. ♀, ♂.

Biology: Evans, 1970. Mus. Compar. Zool., Bul. 140: 488-489 (nest, prey).

*albipes* (Ashmead). Colo., Idaho, Calif.

*Plenoculus albipes* Ashmead, 1899. Psyche 8: 339. ♂.

*arcuata* Williams. Calif. (San Rafael, Menlo Park).

*Solierella arcuata* Williams, 1950. Calif. Acad. Sci., Proc. (4) 26: 378. ♀, ♂.

*australis* Williams. Calif. (Riverside).

*Solierella australis* Williams, 1950. Calif. Acad. Sci., Proc. (4) 26: 379. ♀, ♂.

*bicolor* Williams. Calif.

*Solierella bicolor* Williams, 1950. Calif. Acad. Sci., Proc. (4) 26: 382. ♀.

*blaisdelli* (Bridwell). Calif., Ariz., Idaho. Ecology: Nests in stems of *Eriogonum*, sumac, elderberry, raspberry, and in borings in wood. Parasite: *Pseudolopyga taylori* (Bod.),

- Hedychridium solierellae* Boh. and Brum.; *Lomachaeta variegata* Mick. Prey: *Nysius raphanus* How., *N. tenellus* Barber, *N. ericae minutus* Uhl., *N. sp.*; nymphs.  
*Silaon blaisdelli* Bridwell, 1920. Hawaii. Ent. Soc., Proc. 4: 401. ♀.
- Taxonomy: Evans, 1958. Amer. Ent. Soc., Trans. 84: 123, fig. 42 (larva). — Evans, 1964. Amer. Ent. Soc., Trans. 90: 285 (larva).
- Biology: Williams, 1950. Calif. Acad. Sci., Proc. (4) 26: 394 (prey). — Parker and Bohart, 1966. Pan-Pacific Ent. 42: 95 (nest, parasite). — Krombein, 1967. Trap-nesting wasps and bees, pp. 177-178 (nest, prey, parasite, life cycle). — Carrillo, 1967. Pan-Pacific Ent. 43: 201-203 (larval instars). — Parker and Bohart, 1968. Pan-Pacific Ent. 44: 3 (nest, parasites). — Carrillo and Caltagirone, 1970. Ent. Soc. Amer., Ann. 63: 676-677 (nest, prey, parasites, life cycle).
- boharti** Williams. Calif.  
*Solierella boharti* Williams, 1950. Calif. Acad. Sci., Proc. (4) 26: 366. ♀.  
*Solierella lasseni* Williams, 1950. Calif. Acad. Sci., Proc. (4) 26: 366. ♀, ♂.
- Taxonomy: Williams, 1953. Pan-Pacific Ent. 29: 157 (synonymy).
- boregensis** Williams. Calif. (San Diego Co.).  
*Solierella boregensis* Williams, 1958. Pan-Pacific Ent. 34: 208, fig. 2. ♀, ♂.
- bridwelli** Williams. Calif.  
*Solierella bridwelli* Williams, 1950. Calif. Acad. Sci., Proc. (4) 26: 384. ♀, ♂.
- californica** Williams. Calif. (Los Angeles).  
*Solierella californica* Williams, 1950. Calif. Acad. Sci., Proc. (4) 26: 387. ♀, ♂.
- clypeata** Williams. Calif.  
*Solierella clypeata* Williams, 1950. Calif. Acad. Sci., Proc. (4) 26: 376. ♀.
- corizi** Williams. Calif., Tex. Ecology: Nests in burrows of other insects in soil, makes 2-3 cells per nest and stores 3-4 prey per cell. Prey: *Corizus hyalinus* (F.) adult and nymphs; *Perilabus abbreviatus* (Uhl.) nymph.  
*Solierella corizi* Williams, 1950. Calif. Acad. Sci., Proc. (4) 26: 372. ♀, ♂.
- Biology: Williams, 1950. Calif. Acad. Sci., Proc. (4) 26: 392-394 (nest, prey transport).
- fossor** (Rohwer). Colo., N. Mex., Ariz. Prey: Oedipodinae sp. nymph.  
*Niteliopsis foxii* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 207. ♀. Preocc.  
*Niteliopsis fossor* Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 116 ♀, ♂.
- Biology: Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 116 (prey).
- foxii** (Viereck). N. J. (North Woodbury).  
*Plenoculus foxii* Viereck, 1902. Ent. News 13: 73. ♀, ♂.
- inermis** (Cresson). N. C., Fla., Ill. to Tex. west to Idaho and Colo. Ecology: Nests in abandoned burrows of other arthropods in sand or clay. Prey: *Thyanta pallidovirens* (Stal); *Harmostes reflexulus* (Say), *Liorhyssus hyalinatus* (F.); *Chariesterus antennator* (F.); *Rhynocoris ventralis* (Say)?; Miridae sp.; all prey stored were nymphs.  
*Nyssont inermis* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 224. ♀.
- Biology: Williams, 1914 (1913). Kans. Univ. Sci. Bul. 8: 208-209, pl. 30, fig. 119 (nest, prey). — Kurczewski, 1967. Kans. Ent. Soc., Jour. 40: 203-208, 1 fig. (nest, prey, egg).
- kansensis** (Williams). Kans.  
*Niteliopsis kansensis* Williams, 1914 (1913). Kans. Univ. Sci. Bul. 8: 178. ♀.
- levis** Williams. Calif.  
*Solierella levis* Williams, 1950. Calif. Acad. Sci., Proc. (4) 26: 383. ♀.
- lucida** (Rohwer). Colo. (Boulder).  
*Niteliopsis lucidus* Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 109. ♂.
- major** (Rohwer). Wash., Calif.  
*Silaon major* Rohwer, 1917. U. S. Natl. Mus., Proc. 53: 247. ♀.
- masoni** Williams. Calif. (Thousand Palms).  
*Solierella masoni* Williams, 1959. Ent. Soc. Wash., Proc. 61: 74, 5 figs. ♀, ♂.
- mirifica** Pate. Ariz. (Pima Co.).  
*Solierella (Silaon) mirificus* Pate, 1934. Ent. News 45: 243. ♂.



**modesta** (Rohwer). Colo. (Boulder).

*Niteliopsis modestus* Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 116. ♂.

**nigrans** Krombein. W. Va., Colo., Calif.

*Niteliopsis niger* Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 115. ♀, ♂. Preoce.

*Solierella nigrans* Krombein, 1951. U. S. Dept. Agr., Monog. 2: 943. N. name.

**nitens** Williams. Calif. Ecology: Nests in ground.

*Solierella nitens* Williams, 1950. Calif. Acad. Sci., Proc. (4) 26: 376. ♀.

Biology: Williams, 1950. Calif. Acad. Sci., Proc. (4) 26: 395 (nest).

**peckhami** (Ashmead). N. Y. to Fla. west to Idaho and Calif.; adventive in Hawaii and Marshall Islands. Ecology: Nests in cavities in twigs, stems of elderberry, sumac, raspberry, and in cavities in almond hulls. Parasite: *Pseudolopyga taylori* (Bod.). Prey: *Nysius raphanus* How., *N. tenellus* Barber, *N. ericae* minutus Uhl., *N. sp.*, *Pachybrachius* sp.; nymphs.

*Plenoculus peckhami* Ashmead, 1897. Psyche 8: 130. ♂.

*Plenoculus niger* Ashmead, 1899. Psyche 8: 339. ♀.

*Silaon rohweri* Bridwell, 1920. Hawaii. Ent. Soc., Proc. 4: 398.

*Solierella* (*Silaon*) *arenaria* Krombein, 1939. Brooklyn Ent. Soc., Bul. 34: 139. ♀.

Taxonomy: Carrillo and Caltagirone, 1970. Ent. Soc. Amer., Ann. 63: 673, figs. 3-6 (egg, larva, pupa).

Biology: Peckham and Peckham, 1905. Wasps, Social and Solitary, pp. 95-96 (nest, prey).

—Rau and Rau, 1918. Wasp Studies Afield, pp. 134-135 (nest, parasite). —Bridwell, 1920.

Hawaii. Ent. Soc., Proc. 4: 399-400 (nest, prey). —Williams, 1926. Hawaii. Ent. Soc., Proc. 6:

442-444, figs. 4-7 (nest, prey, life cycle). —Rau, 1928. Acad. Sci. St. Louis, Trans. 25:

375-378, figs. 48, 49 (nest, life cycle). —Williams, 1950. Calif. Acad. Sci., Proc. (4) 26: 394

(prey). —Carrillo, 1967. Pan-Pacific Ent. 43: 201-203 (larval instars). —Carrillo and

Caltagirone, 1970. Ent. Soc. Amer., Ann. 63: 673-676, figs. 1, 2, 7 (nest, prey, life cycle, parasites).

**plenoculoides plenoculoides** (Fox). N. H. to Va., west to Colo. and Tex., Ariz. Ecology: Nests in galls on goldenrod of *Eurosta solidaginis* (Fitch).

*Niteliopsis plenoculoides* Fox, 1893. Psyche 6: 555. ♀.

Biology: Krombein, 1951. U. S. Dept. Agr., Monog. 2: 943 (nest).

**plenoculoides similis** (Bridwell). Calif., Oreg. Ecology: Nests in borings in stems of *Sambucus*,

*Foeniculum*, *Eriogonum* and Umbelliferae, stores up to 4 prey per cell. Parasite:

*Senotainia trilineata* (Wulp); *Eurytoma stigmii* Ashm.; *Lomachaeta variegata* Mick.

Prey: Acrididae sp. nymphs.

*Silaon similis* Bridwell, 1920. Hawaii. Ent. Soc., Proc. 4: 402. ♀.

Biology: Williams, 1950. Calif. Acad. Sci., Proc. (4) 26: 391-392 (nest, prey). —Parker and

Bohart, 1966. Pan-Pacific Ent. 42: 95 (nest, parasites).

**prosopidis** Williams. Calif. (San Bernardino Co.). On flowers of *Prosopis*.

*Solierella mandibularis* Williams, 1958. Pan-Pacific Ent. 34: 212, figs. 4, 4a. ♀. Preoce.

*Solierella prosopidis* Williams, 1959. Pan-Pacific Ent. 35: 116. N. name.

**sayi** (Rohwer). Colo., Calif. Ecology: Nests in sand, stores several prey per cell. Prey: *Psocus californicus* Bks. adults; *Lepidilla kelloggi* Ribago.

*Niteliopsis sayi* Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 114. ♀, ♂.

Biology: Williams, 1950. Calif. Acad. Sci., Proc. (4) 26: 395 (nest, prey).

**semirugosa** Williams. Calif. (San Diego, Riverside and Yolo Counties).

*Solierella semirugosa* Williams, 1958. Pan-Pacific Ent. 34: 210, figs. 3-3d. ♀, ♂.

**sonorae** Williams. Calif.

*Solierella sonorae* Williams, 1950. Calif. Acad. Sci., Proc. (4) 26: 368. ♀.

**striatipes** (Ashmead). Calif.; Mexico (Baja California). Ecology: Makes unicellular nest in soil which may contain 1-2 prey each bearing an egg. Parasite: *Taxigramma* sp.? Prey:

*Melanoplus ligneolus* Scudd. adult and penultimate instar nymph.

*Niteliopsis striatipes* Ashmead, 1899. Ent. News 10: 9. "♀" = ♂.

Biology: Williams, 1950. Calif. Acad. Sci., Proc. (4) 26: 389-391, fig. 3 (nest, prey hunt and transport).

**timberlakei** Williams. Calif.

*Solierella timberlakei* Williams, 1950. Calif. Acad. Sci., Proc. (4) 26: 380. ♀.

**vandykei** Williams. Calif. (Tahoe).

*Solierella vandykei* Williams, 1950. Calif. Acad. Sci., Proc. (4) 26: 371. ♀.

**vierecki** (Rohwer). Colo., Ariz., Calif.

*Nitelopsis vierecki* Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 112. ♀, ♂.

*Nitelopsis parvus* Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 113. ♂.

**weberi** Williams. Calif. (Riverside).

*Solierella weberi* Williams, 1955. Pan-Pacific Ent. 31: 85, 1 fig. ♂.

### Genus MISCOPHUS Jurine

The shallow nests of these wasps are dug in loose sandy soil and contain one or several cells. The prey consists of small, usually immature spiders and the number stored per cell ranges from 2 to 30.

Biology: Kurczewski, 1969. Kans. Ent. Soc., Jour. 42: 470-509, 13 figs. (comparative behavior).

### Genus MISCOPHUS Subgenus MISCOPHUS Jurine

*Miscophus* Jurine, 1807. Nouv. Meth. Class. Hym. Dipt., p. 206.

Type-species: *Miscophus bicolor* Jurine. Monotypic.

**americanus** Fox. N. Y. to Fla. west to Colo., Kans. and Tex., N. W. T. Ecology: Makes a 1-celled nest in loose to well-packed sand and provides 5-11 small spiders per cell. Prey:

*Theridion australe* Bks., *T. differens* Em., *T. murarium* Em.

*Miscophus americanus* Fox, 1890 Ent. News 1: 138. ♀.

Biology: Kurczewski, 1969. Kans. Ent. Soc., Jour. 42: 472-479, figs. 1, 3-5, 13 (nest, prey transport, egg).

### Genus MISCOPHUS Subgenus NITELOPTERUS Ashmead

*Nitelopterus* Ashmead, 1896. In Kohl, K. K. Naturhist. Hofmus., Ann. 11: 497.

Type-species: *Nitelopterus slosonae* Ashmead. Monotypic.

*Miscophus* subg. *Hypomiscophus* Cockerell, 1898. Ann. and Mag. Nat. Hist. (7) 2: 321.

Type-species: *Miscophus* (*Hypomiscophus*) *arenarum* Cockerell. Monotypic.

*Miscophinus* Ashmead, 1898. Ent. News 9: 187.

Type-species: *Miscophinus laticeps* Ashmead. Orig. desig.

Biology: Powell, 1967. Kans. Ent. Soc., Jour. 40: 331-346, 1 fig. (comparative behavior of some N. Amer. spp.).

**aenescens** (Bridwell). Oreg. (Mt. Jefferson).

*Hypomiscophus aenescens* Bridwell, 1920. Hawaii. Ent. Soc. Proc. 4: 394. ♂.

**arenarum** Cockerell. N. Mex. (Mesilla Park).

*Miscophus* (*Hypomiscophus*) *arenarum* Cockerell, 1898. Ann. and Mag. Nat. Hist. (7) 2: 321. ♀.

**californicus** (Ashmead). Calif., Ariz.

*Miscophinus californicus* Ashmead, 1898. Ent. News 9: 188. ♂.

**cyanurus** (Rohwer). Colo. (Boulder).

*Miscophinus cyanurus* Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 125. ♀, ♂.

**evansi** (Krombein). Wyo., Wash. Ecology: Nests in sand, constructs up to 6 cells per nest and stores 10-20 small spiders per cell. Parasite: *Senotainia* sp. in *trilineata* (Wulp) complex ? Prey: *Dictyna* sp. juveniles.

*Nitelopterus evansi* Krombein, 1963. Ent. News 74: 61. ♀.

Taxonomy: Evans, 1964. Amer. Ent. Soc., Trans. 90: 283, figs. 88-92 (larva).

Biology: Evans, 1963. Ent. News 74: 234-236, figs. 1-2 (nest, prey, parasite). — Evans, 1970.

Mus. Compar. Zool., Bul. 140: 489 (nest, prey, parasite).

**galei** (Rohwer). Colo.

*Miscophinus galei* Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 124. "♀" = ♂.

**kansensis** (Slansky). Kans. (Lawrence). Ecology: Makes a 1-celled nest in sand, usually stores 13-16 small spiders per cell, although as few as 7 or as many as 29 prey may be placed in a single completed cell. Prey: *Theridion rabuni* Chamb. and Ivie, *T. glaucescens* Beck., *Euryopis texana* Bks.; *Tennesseellum formica* (Em.); *Grammonota sclerata* Ivie and Barr.; *Tetragnatha laboriosa* Hentz; *Oxyopes salticus* Hentz; *Dictyna bicornis* Em., *D. sp.*; mostly immatures are stored although adults are used occasionally.

*Nitelopterus kansensis* Slansky, 1969. Kans. Ent. Soc., Jour. 42: 467, 3 figs. ♂, ♀.

Biology: Kurczewski, 1969. Kans. Ent. Soc., Jour. 42: 483-492, figs. 2, 6-8, 13 (nest, prey transport, egg).

**laticeps** (Ashmead). Calif., Ariz. Ecology: Makes 1-celled nest in sand, stores 4-8 prey per completed cell. Prey: *Psilochorus rockefelleri* Gertsch adults; *Oecobius* sp. juvenile; *Sitticus* sp., *Pellenes* sp., both juveniles; *Pardosa* sp. juvenile.

*Miscophinus laticeps* Ashmead, 1898. Ent. News 9: 188. ♀.

Biology: Cazier and Mortenson, 1965. Pan-Pacific Ent. 41: 21-26, 1 fig. (nest, prey, egg).

—Powell, 1967. Kans. Ent. Soc., Jour. 40: 332-345 (nest, prey transport, egg, life cycle; misdet. as *californicus*).

**maurus** (Rohwer). Colo.

*Miscophinus maurus* Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 126. ♀, ♂.

**nigrescens** (Rohwer). Colo. (Rifle).

*Miscophinus nigrescens* Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 125. ♀.

**nigriceps** (Rohwer). Calif. (Santa Monica).

*Miscophinus nigriceps* Rohwer, 1911. U. S. Natl. Mus., Proc. 40: 587. ♀.

**slossonae barberi** (Krombein). Fla. Ecology: Makes a 1-celled nest in sand and provides up to 3 prey per cell. Prey: *Meioneta formica* (Em.); *Pellenes* sp.; *Lycosa* sp., *Geolycosa* sp.; all prey were immatures.

*Nitelopterus slossonae barberi* Krombein, 1954. Amer. Ent. Soc., Trans. 80: 12, fig. 8. ♀.

Taxonomy: Evans, 1964. Amer. Ent. Soc., Trans. 90: 283-284 (larva).

Biology: Krombein and Kurczewski, 1963. Biol. Soc. Wash., Proc. 76: 140-143 (nest, prey hunt and transport). —Krombein, 1964. Amer. Mus. Novitates 2201: 14-15 (nest, prey, life cycle).

**slossonae slossonae** (Ashmead). Fla. Ecology: Makes a 1-celled nest in sand and provides up to 11 small spiders in a completed cell. Prey: *Habrocestum pulex* (Hentz), *Metaphidippus* sp.; *Meioneta formica* (Em.); *Dictyna altamira* Gertsch and Davis; *Arctosa* sp., *Lycosa* spp., *Pardosa* sp.; *Steatoda ergoniformis* (Camb.); *Tetragnatha laboriosa* Hentz; most prey were juveniles but occasionally adults were used.

*Nitelopterus slossonae* Ashmead, 1896. In Kohl, K. K. Naturhist. Hofmus., Ann. 11: 497. ♂.

Biology: Krombein and Evans, 1954. Ent. Soc. Wash., Proc. 56: 232 (prey transport).

—Krombein and Evans, 1955. Ent. Soc. Wash., Proc. 57: 231 (prey transport, nest).

—Krombein and Kurczewski, 1963. Biol. Soc. Wash., Proc. 76: 140-143 (nest, prey transport). —Krombein, 1964. Amer. Mus. Novitates 2201: 13-14 (prey transport).

—Kurczewski, 1969. Kans. Ent. Soc., Jour. 42: 494-500, figs. 9-12 (nest, prey transport, egg).

**texanus** (Ashmead). Tex., Ariz. Ecology: Nests in loose sand. Prey: *Steatoda fulva* Keys. subadult, *Latrodectus mactans* F. juvenile.

*Miscophinus texanus* Ashmead, 1898. Ent. News 9: 189. ♀.

Biology: Cazier and Mortenson, 1965. Pan-Pacific Ent. 41: 26-28 (nest, prey transport; the wasp was provisionally identified as *texanus*).

**timberlakei** (Bridwell). Calif. (Mt. San Jacinto).

*Hypomiscophus timberlakei* Bridwell, 1920. Hawaii. Ent. Soc., Proc. 4: 394. ♀.

## Genus NITELA Latreille

## Genus NITELA Subgenus NITELA Latreille

*Nitela* Latreille, 1809. Gen. Crust. Ins., v. 4, p. 77.

Type-species: *Nitela Spinolae* Latreille. Monotypic.

*Rhinonitela* Williams, 1928. Hawaii Sugar Planters' Assoc. Expt. Sta., Bul. Ent. Ser. 19: 97.

Type-species: *Rhinonitela domestica* Williams. Orig. desig.

Only the typical subgenus occurs in North America. Two of our species have been recorded as nesting in abandoned burrows of other insects in wood or twigs. There are no prey records for American species; several Palaearctic species have been reported to prey upon Psocoptera, Aphididae and Psyllidae.

Taxonomy: Pate, 1937. Brooklyn Ent. Soc., Bul. 32: 5-7 (key to N. Amer. spp.).

*cerasicola* Pate. N. Y. (Long Isl.). Ecology: Reared from burrow in dead cherry tree.

*Nitela cerasicola* Pate, 1937. Brooklyn Ent. Soc., Bul. 32: 5. ♀.

*floridana* Pate. Fla.

*Nitela floridana* Pate, 1934. Ent. News 45: 241. ♀.

*leoni* Krombein. Fla.

*Nitela leoni* Krombein, 1968. Nat. Canad. 95: 700. ♀, ♂.

*townesorum* Krombein. Calif. (Yosemite Park).

*Nitela townesorum* Krombein, 1950. Pan-Pacific Ent. 26: 130. ♀.

*virginiensis* Rohwer. N. Y. to Fla., W. Va., Mich., Wis., Miss. Ecology: Nests in twigs of *Rhus glabra*.

*Nitela virginiensis* Rohwer, 1923. Ent. Soc. Wash., Proc. 25: 100. ♀.

Taxonomy: Krombein, 1958. Ent. Soc. Wash., Proc. 60: 60. ♂.

Biology: Krombein, 1951. U. S. Dept. Agr., Monog. 2: 945 (nest).

## SUBFAMILY TRYPOXYLONINAE

So far as known all members of this subfamily prey upon small spiders, storing rather large numbers per cell. A few species nest in the ground, utilizing pre-existing cavities or burrows of other arthropods. A number of species build free mud cells; our familiar pipe-organ wasp, *Trypargilum politum*, is the only North American representative having this habit. The majority of species nest above ground in cavities of various kinds such as abandoned beetle borings in twigs, logs or structural timber, old mud-dauber nests and hollow stems.

Taxonomy: Evans, 1957. Amer. Ent. Soc., Trans. 83: 89-99, figs. 36-68 (larvae). —Evans, 1959.

Amer. Ent. Soc., Trans. 85: 157-161, figs. 64-70 (larvae).

## Genus PISONOPSIS Fox

*Pisonopsis* Fox, 1893. Psyche 6: 553.

Type-species: *Pisonopsis clypeata* Fox. Monotypic.

The North American *birkmanni* makes a linear series of cells in borings in stems. *P. clypeata* apparently usually makes a similar series of cells in pre-existing burrows in the soil, but it has also been reported as nesting in trap stems at ground level.

Revision: Williams, 1954. Pan-Pacific Ent. 30: 235-246 (N. Amer. spp.).

*birkmanni* Rohwer. Tex. to south. Calif.; Mexico. Ecology: Nests in borings in *Sambucus*, in stems of oats, white sage, poison hemlock, and in trap stems. Parasite: *Ceratochrysis antyga* Boh.; *Photopsis* sp. Prey: Thomisidae spp.

*Pisonopsis birkmanni* Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 129. ♀.

Taxonomy: Evans, 1959. Amer. Ent. Soc., Trans. 85: 157, figs. 64-70 (larva).

Biology: Williams, 1954. Pan-Pacific Ent. 30: 236, 238 (nest, prey, cocoon). —Parker and Bohart, 1966. Pan-Pacific Ent. 42: 94-95 (nest, parasite). —Parker and Bohart, 1968.

Pan-Pacific Ent. 44: 3 (nest, parasite).

**clypeata clypeata** Fox, Wyo., Nev., Calif. Ecology: Nests in pre-existing burrows in soil and in trap stems, making a linear series of cells, provides 9-17 prey per cell. Parasite: Sarcophagidae sp. Prey: *Chrysso nordica* (Chamb. and Ivie), *Theridion rabuni* (Chamb. and Ivie), *T. petraeum* (Koch); *Singa* sp.; most of prey were adult females, but one juvenile was stored.

*Pisonopsis clypeata* Fox, 1893. Psyche 6: 553. ♀, ♂.

Biology: Parker and Bohart, 1968. Pan-Pacific Ent. 44: 3 (nest, parasite). — Evans, 1969. Kans. Ent. Soc., Jour. 42: 118-121, figs. 1-4 (nest, prey transport).

**clypeata occidentalis** Williams. Calif. Ecology: Nests in ground in *Diadasia* burrows.

*Pisonopsis clypeata occidentalis* Williams, 1954. Pan-Pacific Ent. 30: 242, figs. 1-5, 8, 10, 15, 20, 22, 23, 26, 29. ♀, ♂.

Biology: Linsley, MacSwain and Smith, 1952. Calif. Univ. Pubs. Ent. 9: 274 (nest).

**triangularis californica** Williams. Calif.

*Pisonopsis triangularis californica* Williams, 1954. Pan-Pacific Ent. 30: 245, figs. 6, 9, 11, 13, 16-18, 24, 31. ♀, ♂.

**triangularis triangularis** Ashmead. Colo., Wyo., Idaho, Calif.

*Pisonopsis triangularis* Ashmead, 1899. Ent. News 10: 9. ♀.

### Genus PISON Jurine

#### Genus PISON Subgenus PISON Jurine

*Pison* Jurine, 1808. In Spinola, Insectorum Liguria, v. 2, p. 255.

Type-species: *Pison Jurini* Spinola. Monotypic.

*Tachybulus* Latreille, 1809. Gen. Crust. Ins., v. 4, p. 75.

Type-species: *Tachybulus niger* Latreille. Monotypic.

*Nephridia* Brulle, 1833. Soc. Ent. France, Ann. 2: 408.

Type-species: *Nephridia Xanthopus* Brulle. Monotypic.

*Pison* subg. *Pisonitus* Shuckard, 1838. Ent. Soc. London, Trans. 2: 79.

Type-species: *Pison (Pisonitus) argentatus* Shuckard. Desig. by Pate, 1937.

*Pseudo-Nysson* Radoszkowski, 1876. Soc. Ent. Rossica, Horae 12: 104.

Type-species: *Pseudo-Nysson fasciatus* Radoszkowski. Monotypic.

*Taranga* Kirby, 1883. Ent. Soc. London, Trans., p. 201.

Type-species: *Taranga dubia* Kirby. Monotypic.

*Pisum* Agassiz, 1847. Nomencl. Zool., fasc. 12, p. 293. Emend. Preocc.

*Pisum* Schulz, 1906. Spolia Hym., p. 212. Emend. Preocc.

It is not at all certain that the single species of typical *Pison* described from North America was correctly labeled as to locality. It has never been collected since in Georgia. In habitus the unique holotype is very reminiscent of some of the glossy black Micronesian and Melanesian species which suggests that perhaps it actually came from New Georgia in the Solomon Islands.

**laeve** Smith. Ga.

*Pison laevis* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 317. "♀" = ♂.

#### Genus PISON Subgenus KROMBEINIELLUM Richards

*Paraceramius* Radoszkowski, 1887. Soc. Ent. Rossica, Horae 21: 432. Preocc.

Type-species: *Paraceramius Koreensis* Radoszkowski. Monotypic.

*Pison* subg. *Krombeiniellum* Richards, 1962. A Revisional Study of the Masarid Wasps, p. 118. N. name.

Taxonomy: Menke, 1968. Canad. Ent. 100: 1100-1107, 15 figs. (review of New World spp.).

**agile** (Smith) Md., Va., Ill., Mich., Kans.; Japan, Korea, China, India, Sri Lanka. Ecology: Makes delicate mud cells in cracks, small depressions, old *Sceliphron* nests; cells are placed side by side, end to end, or in a clump; stores 20-31 small spiders per cell. Adventive after World War II, probably from Japan. Parasite: *Melittobia chalybii* Ashm. Prey: *Dictyna bellans* Chamb., *D. sublata* Hentz, *D. sp.*; both adults and juveniles.

*Parapison agilis* Smith, 1869. Ent. Soc. London, Trans., p. 300. ♀.

*Paracerasmus Koreensis* Radoszkowski, 1887. Soc. Ent. Rossica, Horae 21: 433, figs. 1-3.  
♀. N. syn. (K. V. Krombein).

Taxonomy: Krombein, 1958. Ent. News 69: 166-167. — Sheldon, 1968. Psyche 75: 111-114, figs. 5-10 (egg, larva, cocoon).

Biology: Krombein, 1958. Ent. News 69: 167 (nest, cocoon). — Sheldon, 1968. Psyche 75: 107-111, figs. 1-4 (nest, prey transport).

### Genus TRYPOXYLON Latreille

*Trypoxylon* Latreille, 1796. Precis Caract. Gen. Ins., p. 121. No species.

Type-species: *Trypoxylon figulus* Linnaeus. First included species.

*Triopoxylon* Spinola, 1806. Insectorum Liguria, v. 1, p. 65. Lapsus or emend.

*Apius* Panzer, 1806. Krit. Rev. Insektenf. Deutschlands, v. 2, p. 106.

Type-species: *Sphex figulus* Linnaeus. Monotypic.

*Apius* Jurine, 1807. Nouv. Meth. Class. Hym. Dipt., p. 140. Preocc.

Type-species: *Sphex figulus* Fabricius. Desig. by Morice and Durrant, 1915.

*Trypoxylon* Jurine, 1807. Nouv. Meth. Class. Hym. Dipt., pp. 2, 141. Lapsus or emend.

*Trypoxylum* Agassiz, 1847. Nomencl. Zool., p. 380. Emend.

*Trypoxylum* Schulz, 1906. Spolia Hym., p. 212. Emend. Preocc.

*Trypoxylon* subg. *Asaconoton* Arnold, 1959. South. Rhodesia Natl. Mus., Occas. Papers, no. 23, B, p. 322.

Type-species: *Trypoxylon (Asaconoton) egregium* Arnold. Orig. desig.

Sandhouse (1940) is the most reliable source for identification of North American species for Richards (1934) does not include all of our species. The revisions cited below include the species of both *Trypoxylon* and *Trypargilum* which are considered herein to be separate genera.

Most species of *Trypoxylon* nest in pre-existing cavities such as hollow stems or twigs, abandoned beetle borings in dead wood or structural timber, or, rarely, in soil. The Species Group Fabricator is unusual in that some species build free mud cells whereas others nest in pre-existing cavities in wood or soil. The preferred prey of the North American species are small spiders, usually immatures, belonging to several families of snare-builders, but errant spiders are used occasionally; as few as 4 and as many as 20 spiders may be stored in a single cell. *Trypoxylon* males do not participate in some of the nesting activities as do those belonging to *Trypargilum*; there is one report of a male usually being present in the nest of an extralimital species of the Fabricator Group, but this needs confirmation. The cocoons of our North American species are delicate silken structures except in *johnsoni* which constructs a brittle cocoon incorporating sand from the cell partition.

Revision: Fox, 1891. Amer. Ent. Soc., Trans. 18: 136-148, 1 pl. (N. Amer. spp.). — Fox, 1893.

Acad. Nat. Sci. Phila., Proc. 45: 472-474 (revised key to N. Amer. spp.). — Richards, 1934.

Roy. Ent. Soc. London, Trans. 82: 173-362, 56 text figs., 5 pls. (New World spp.).

— Sandhouse, 1940. Amer. Midland Nat. 24: 133-176, 4 pls. (N. Amer. spp.).

#### SPECIES GROUP FIGULUS

Members of Species Group Fabricator are included here.

*aldrichi* Sandhouse. Alta., Mont. and Wyo. west to B. C. and north. Calif. Ecology: Nests in borings in trap stems. Predator: *Philaenus zebratus nitens* (Bks.).

*Trypoxylon (Trypoxylon) aldrichi* Sandhouse, 1940 Amer. Midland Nat. 24: 158, figs. 25, 53, 62, 66, 67. ♀, ♂.

Taxonomy: Evans, 1957. Amer. Ent. Soc., Trans. 83: 95, figs. 56-58 (larva).

Biology: Parker and Bohart, 1966. Pan-Pacific Ent. 42: 95 (nest).

*bidentatum* Fox. Wash. and Idaho south to Calif. and Ariz. Ecology: Nests in borings in *Sambucus* and in trap stems. Parasite: *Trichrysis doriae* (Grib.).

*Trypoxylon bidentatum* Fox, 1891. Amer. Ent. Soc., Trans. 18: 143. ♀, ♂ (? in part).

*Trypoxylon morrisoni* Richards, 1934. Roy. Ent. Soc. London, Trans. 82: 319. ♀.

Biology: Parker and Bohart, 1966. Pan-Pacific Ent. 42: 95 (nest, parasite).

*clarkei* Krombein. Mass. to Fla., Tenn., Ill., Mo., Tex. Ecology: Nests in trap-nests, stores 4-6 prey per cell. Prey: *Mangora gibberosa* Hentz.

*Trypoxylon (Trypoxylon) clarkei* Krombein, 1962. Biol. Soc. Wash., Proc. 75: 9. ♂, ♀.

Biology: Krombein, 1967 Trap-nesting wasps and bees, pp. 229-230 (nest, prey, life cycle).

*fastigium* Fox. D. C., Ga., Miss., Tex., Okla., Mo., Ark., Kans., Nebr., Idaho, Utah, Nev., Ariz., Calif. Parasite: *Trichrysis doriae* (Grib.).

*Trypoxylon carinifrons* Fox, 1891. Amer. Ent. Soc., Trans. 18: 142. ♀, ♂. Preocce.

*Trypoxylon fastigium* Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 476. N. name.

*Trypoxylon subfrigidum* Rohwer, 1909. Ent. News 20: 378. ♂.

*Trypoxylon nigrellum* Rohwer, 1909. Ent. News 20: 379. ♀.

*figulus figulus* (Linnaeus). Que., Maine, N. H., Mass.; Europe. Ecology: In Europe it nests in hollow stems or beetle borings and preys mostly upon Araneidae. Possibly adventive in North America. Parasite: *Perithous divinator* (Rossi). Other subspp. occur in the Palaearctic Region.

*Sphex figulus* Linnaeus, 1758. Syst. Nat., ed. 10, p. 570.

*Sphex fuliginosus* Scopoli, 1763. Ent. Carn., p. 292.

*Trypoxylon figulum* var. *major* Kohl, 1883. Schweiz. Ent. Ges., Mitt. 6: 657. ♂.

*Trypoxylon apicalis* Fox, 1891. Amer. Ent. Soc., Trans. 18: 142, fig. 10. ♀.

*Trypoxylon figulum* var. *minor* de Beaumont, 1945. Schweiz. Ent. Ges., Mitt. 19: 478. ♀, ♂.

Taxonomy: Giordani Soika, 1934. Soc. Ent. France, Ann. 103: 342-343, pl. 3, fig. 2 (larva).

—Pate, 1943. Brooklyn Ent. Soc., Bul. 38: 46 (synonymy of *apicale*).

*frigidum frigidum* Smith. Hudson Bay south to N. C., west to Wash. and N. Mex. Ecology:

Nests in hollow stems and twigs, in abandoned beetle borings in dead wood and structural timber, and in trap-nests, stores 4-16 prey per cell. Parasite: *Pyemotes ventricosus* (Newp.); *Megaselia* sp.; *Anthrax* sp.; *Amobia distorta* (Allen); *Melittobia chalybii* Ashm.; Cleonymidae sp., possibly *Ptinobius magnificus* (Ashm.); *Trichrysis doriae* (Grib.). Prey: *Achaearanea globosa* (Hentz), *Thymoites unimaculata unimaculata* (Em.), *Theridion albidum* Bks., *T. differens* Em., *T. frondeum* Hentz ?, *T. globosum* Hentz, *T. lyra* Hentz, *T. murarium* Em., *T. sp.* in Murarium Group, *T. unimaculatum* Em.; Salticidae sp.; *Eustala anastera* (Walck.), *E. sp.*, Araneidae spp.; *Tennesseellum formicum* (Em.); *Leucauge venusta* (Walck.), *Tetragnatha* sp.; *Ceratinopsis interpres* Camb., *C. purpureus* Keys, Micryphantidae sp.; both adults and immatures are stored and most are snare-building species. Other subspp. occur in the Palaearctic Region.

*Trypoxylon frigidum* Smith, 1856. Cat. Hym. Brit Mus., v. 4, p. 381. ♀.

*Trypoxylon plesium* Rohwer, 1920. U. S. Natl. Mus., Proc. 57: 229. ♀.

Taxonomy: Evans, 1957. Amer. Ent. Soc., Trans. 83: 96, figs. 59-60 (larva).

Biology: Packard, 1867. Ent. Soc. Phila., Proc. 6: 415 (nest). —Rau, 1922. Acad. Sci. St. Louis, Trans. 24: 22. —Blackman and Stage, 1924. N. Y. State Col. Forestry, Syracuse Univ., Tech. Pub. 17: 197 (nest). —Rau, 1926. Acad. Sci. St. Louis, Trans. 25: 197 (nest). —Rau, 1928. Acad. Sci. St. Louis, Trans. 25: 439-441, figs. 65, 66 (nest, parasites). —Taylor, 1928. Psyche 35: 225 (nest). —Pate, 1937. Brooklyn Ent. Soc., Bul. 22: 5 (nest). —Thomas, 1962. Amer. Midland Nat. 67: 365 (nest, parasite). —Thomas, 1963. Mich. Acad. Sci., Arts, Letters, Papers 48: 127-130 (nest, life cycle, parasite). —Parker and Bohart, 1966. Pan-Pacific Ent. 42: 95 (nest). —Krombein, 1967. Trap-nesting wasps and bees, pp. 223-227, fig. 11 (nest, prey, life cycle, parasites). —Medler, 1967. Amer. Midland Nat. 78: 344-358 (nest, prey, cocoon, parasites, life cycle).

Morphology: Snodgrass, 1941. Smithsn. Inst., Misc. Collect. 99 (14): pl. 21, figs. M-P (male genitalia).

*johnsoni* Fox. Ont., N. Y. to Fla. west to Mich., Mo., Okla., Tex. Ecology: Nests in hollow stems or borings in wood, and possibly in pre-existing burrows in earth. Prey: *Tetragnatha* spp.; *Micrathena gracilis* (Walck.), *Araneus* sp.; prey consisted of immatures and penultimate stages of both sexes.

*Trypoxylon Johnsoni* Fox, 1891. Amer. Ent. Soc., Trans. 18: 147. ♀.

*Trypoxylon ornatipes* Fox, 1891. Amer. Ent. Soc., Trans. 18: 148. ♂.

- Trypoxylon (Trypoxylon) adelphae* Sandhouse, 1940. Amer. Midland Nat. 24: 151. ♀, ♂.  
Taxonomy: Evans, 1957. Amer. Ent. Soc., Trans. 83: 97, fig. 61 (larva).  
Biology: Rau and Rau, 1918. Wasp Studies Afield, pp. 137-139 (nest, prey). — Rau, 1922. Acad. Sci. St. Louis, Trans. 24: 22 (nest ?). — Krombein, 1952. Amer. Ent. Soc., Trans. 78: 93 (prey). — Krombein, 1967. Trap-nesting wasps and bees, pp. 229-231 (nest, prey, life cycle, cocoon).
- kolazyi* Kohl. N. Y. to Ga., W. Va., Ill., Mo.; Austria, Mediterranean area. Ecology: Nests in abandoned anobiid borings in structural lumber and in trap-nests. Adventive from Europe. Parasite: *Trichrysis doriae* (Grib.). Prey: *Tennesseellum formicum* (Em.); Micryphantidae sp.; adults and subadults.  
*Trypoxylon kolazyi* Kohl, 1893. Zool.-Bot. Gesell. Wien, Verhandl. 43: 29. ♂, ♀.  
*Trypoxylon (Trypoxylon) backi* Sandhouse, 1940. Amer. Midland Nat. 24: 164, figs. 18, 74, 75. ♀, ♂. N. syn. (R. E. Coville).
- Biology: Sandhouse, 1940. Amer. Midland Nat. 24: 165 (nest). — Krombein, 1958. Biol. Soc. Wash., Proc. 71: 21-22 (nest, prey). — Thomas, 1962. Amer. Midland Nat. 67: 364 (parasite). — Krombein, 1967. Trap-nesting wasps and bees, pp. 227-228 (nest, prey, life cycle).
- pennsylvanicum pennsylvanicum* Saussure. Que. and Maine to Fla. west to Colo. and Tex. Ecology: Nests in cavity in twig. Prey: Araneidae sp. immature. Another subspecies occurs in Japan.  
*Trypoxylon pennsylvanicum* Saussure, 1867. Reise d. Novara, Zool. 2, Hym., p. 82. ♀.  
Biology: Sandhouse, 1940. Amer. Midland Nat. 24: 160 (nest). — Krombein, 1961. Brooklyn Ent. Soc., Bul. 56: 64 (prey).
- regulare* Viereck. Mo., Kans.  
*Trypoxylon regularis* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 205. "♀" = ♂.
- sculleni* Sandhouse. Mont. to Ariz. west to B. C. and Calif. Ecology: Nests in cavities in twigs, *Sambucus*, *Rhus glabra*, and *Eriogonum*, and in trap stems. Parasite: *Anthrax irroratus* Say; *Trichrysis doriae* (Grib.).  
*Trypoxylon (Trypoxylon) sculleni* Sandhouse, 1940. Amer. Midland Nat. 24: 160, figs. 15, 52, 58, 59, 65. ♀, ♂.
- Biology: Sandhouse, 1940. Amer. Midland Nat. 24: 162 (nest). — Parker and Bohart, 1966. Pan-Pacific Ent. 42: 95 (nest, parasites).

## SPECIES GROUP RUFIDENS

- bridwelli* Sandhouse. Tex. (Brownsville).  
*Trypoxylon (Trypoxylon) bridwelli* Sandhouse, 1940. Amer. Midland Nat. 24: 168, figs. 24, 40. ♂.
- richardsi* Sandhouse. Ont., N. Y. to Fla., west to Mich., Ind., Mo., Ala., Tex. Ecology: Nests in cavity in twig of *Chionanthus virginiana* and in twig gall on oak. Prey: Small spiders.  
*Trypoxylon (Trypoxylon) richardsi* Sandhouse, 1940. Amer. Midland Nat. 24: 167, figs. 22, 42, 43. ♀, ♂.
- Biology: Sandhouse, 1940. Amer. Midland Nat. 24: 168 (nest). — Krombein, 1959. Biol. Soc. Wash., Proc. 72: 101-102 (nest, prey, life cycle).
- timberlakei* Sandhouse. Ariz., Calif. Ecology: Nests in deserted gall of *Callirhytis hamiformis* (Bass.) on *Quercus wislizenii*.  
*Trypoxylon (Trypoxylon) timberlakei* Sandhouse, 1940. Amer. Midland Nat. 24: 169. ♀.
- Biology: Krombein, 1951. U. S. Dept. Agr., Monog. 2: 956 (nest).

## SPECIES GROUP SCUTATUM

- carinatum* Say. U. S. east of 100th meridian north to Mass. Ecology: Reared from burrow in partly decayed trunk of tulip-tree, also nests in borings in wood. Prey: *Theridion lyricum* Walck.  
*Trypoxylon carinatus* Say, 1837. Boston Jour. Nat. Hist. 1: 374. ♂.
- Biology: Sandhouse, 1940. Amer. Midland Nat. 24: 154 (nest). — Krombein, 1967. Trap-nesting wasps and bees, pp. 228-229 (nest, prey, life cycle, cocoon).



## SPECIES GROUP MARGINATUM

**punctivertex** Richards. Okla., Tex. south to Brazil.

*Trypoxylon (Trypoxylon) punctivertex* Richards, 1934. Roy. Ent. Soc. London, Trans. 82: 333. ♀.

## Genus TRYPARGILUM Richards

*Trypoxylon* subg. *Trypargilum* Richards, 1934. Roy. Ent. Soc. London, Trans. 82: 191.

Type-species: *Trypoxylon nitidum* Smith. Orig. desig.

Sandhouse (1940) is the most reliable source for identification of North American species for Richards (1934) does not include all of our species. The revisions cited below include the species of both *Trypargilum* and *Trypoxylon* which are considered herein to be separate genera.

Some aspects of the ethology are unique among wasps. This genus and some species of *Pison* are the only wasps in which males are known to assist in some of the nesting activities. They remain in the nest while the female is hunting for prey and discourage attack by at least some of the parasites that afflict wasps. Activities in which the males may participate include cleaning out a pre-existing boring which is to serve as a nesting site, taking prey from the female and placing it in the cell, and helping the female seal inner partitions of cells with mud which she brings to the nest. The larvae also exhibit unusual behavior in that the cocoon which incorporates silk, other salivary secretions and mud from the cell partition is specifically different in each of the North American species which have been observed.

North American species have been reported to store 3-36 small, usually immature spiders per cell. Some species use only snare-building spiders as prey, one uses predominantly snare-building spiders but does include some errant spiders, and others use predominantly errant types but with a number of snare-builders. This suggests that there are specific differences in the way that groups of species hunt for prey.

In North America members of the Spinosum, Nitidum and Punctulatum Groups nest in pre-existing cavities such as hollow stems or twigs, old insect galls or mud dauber nests, abandoned beetle borings in dead wood or structural timber and in trap-nests. Our single member of the Albitarse Group is a mud dauber and builds the familiar pipe-organ nest.

Revision: Fox, 1891. Amer. Ent. Soc., Trans. 18: 136-148, 1 pl. (N. Amer. spp.). — Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc. 45: 472-474 (revised key to N. Amer. spp.). — Richards, 1934. Roy. Ent. Soc. London, Trans. 82: 173-362, 56 text figs., 5 pls. (New World spp.). — Sandhouse, 1940. Amer. Midland Nat. 24: 133-176, 4 pls. (N. Amer. spp.).

Taxonomy: Krombein, 1959. Ent. Soc. Wash., Proc. 61: 152-153 (key to red-marked Fla. taxa).

Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 178-185, text fig. 2 (male behavior, cocoon differences, prey preferences, competition for nesting sites, differing emergence dates).

## SPECIES GROUP SPINOSUM

Members of this group prey upon both errant and snare-building spiders, but prefer the former by a substantial margin.

**bicalcaratum** (Richards), n. comb. South. Ariz.; Mexico.

*Trypoxylon (Trypargilum) bicalcaratum* Richards, 1934. Roy. Ent. Soc. London, Trans. 82: 235. ♂.

**californicum** Saussure. Tex., N. Mex., Ariz., Utah, Nev., Calif., Oreg., Wash. Ecology: Nests in borings in wood, stores 8-19 prey per cell. Parasite: Chrysididae sp. Prey: *Agassa* sp., *Habronattus* sp., *Metaphidippus* sp., *Phidippus* sp., *Synemosyna* sp., Salticidae spp.; *Ebo* sp., *Misumenops* sp., *Philodromus* sp., Thomisidae spp.; *Oxyopes tridens* Brady, O. sp.; Clubionidae sp.; *Dictyna* sp.; Araneidae spp.; stores mostly errant spiders, only a few snare-builders.

*Trypoxylon californicum* Saussure, 1867. Reise d. Novara, Zool. 2, Hym., p. 78. ♀.

*Trypoxylon arizonense* Fox, 1891. Amer. Ent. Soc., Trans. 18: 145. ♀. N. syn. (R. E. Coville).

Taxonomy: Evans, 1957. Amer. Ent. Soc., Trans. 83: 92, figs. 47-48 (larva).

Biology: Matthews and Matthews, 1968. Psyche 75: 285-293, 2 figs. (nest, prey, cocoon).

- clavatum clavatum* (Say), n. status (R. E. Coville). Ont., U. S. east of Rockies except New England, Ariz. Ecology: Nests in borings in wood, old mud dauber and *Polistes* nests, and old mining bee burrows; stores 5-22 spiders per cell. Parasite: *Pygotes ventricosus* (Newp.); *Anthrax aterrima* (Big.); *Megaselia* sp. ?; *Amobia distorta* (Allen), *Miltogramminae* spp.; *Melittobia chalybii* Ashm.; *Sphaerophthalma p. pensylvanica* (Lep.), *S. p. scaeva* (Bl.); *Trichrysis carinata* (Say). Prey: *Dictyna sublata* (Hentz); *Clubiona* sp., *Clubionidae* sp.; *Anypaena pectorosa* Koch, A. sp., *Anypaenella saltabunda* (Hentz), *Anypaenidae* spp.; *Misumenops asperatus* (Hentz), *M. oblongus* (Keys.), *M. spp.*, *Misumenoides aleatorius* (Hentz), *Synema parvula* (Hentz), *Xysticus triggatus* Keys., *X. spp.*, *Philodromus rufus* Walck., *P. marxii* Keys., *P. pernix* Blackw., *P. satullus* Keys., *P. washita* Bks., *P. spp.*, *Thanatus formicinus* (Oliv.), *T. striatus* Koch, *Misumeninae* spp.; *Salticus scenicus* (L.), *Evarcha hoyi* Peckh., *Onondaga lineata* (Koch), *Habronattus* sp., *Phidippus audax* (Hentz), *P. clarus* Keys., *P. spp.*, *Paraphidippus marginatus* (Walck.), *P. spp.*, *Zygoballus bettini* Peckh., *Z. nervosus* (Peckh.), *Z. serripunctatus* (Hentz), *Thiodina iniquies* (Walck.), *T. puerpera* (Hentz), *Hentzia mitrata* (Hentz), *Maevia vittata* (Hentz), *Icius elegans* (Hentz), *I. hartii* Em., *Metaphidippus insignis* (Bks.), *M. protervus* (Walck.), *M. galathea* (Walck.), *Salicidae* spp.; *Dapanus mira* (Walck.); *Pardosa* sp., *Lycosidae* spp.; *Oxyopes salticus* Hentz, *Oxyopidae* spp.; *Argiope aurantia* Luc., *A. trifasciata* (Forsk.), *Mangora gibberosa* (Hentz), *M. maculata* (Keys.), *Eustala anastera* (Walck.), *E. sp.*, *Neoscona minima* Camb., *N. domiciliorum* (Hentz), *N. sp.*, *Araneus juniperi* (Em.), *A. spp.*, *Araniella displicata* (Hentz), *Araneidae* spp.; *Theridiidae* spp.; *Tetragnatha* sp.; prefers errant to snare-building spiders by ratio of 4:1. Predator: *Cymatodera* sp.?, *Lecontella cancellata* (LeC.); *Trogoderma ornatum* Say.
- Trypoxylon clavatus* Say, 1837. Boston Jour. Nat. Hist. 1: 374.
- Trypoxylon annulare* Dahlbom, 1844. Hym. Europaea, v. 1, pp. 282, 509. ♀.
- Trypoxylon rufozonalis* Fox, 1891. Amer. Ent. Soc., Trans. 18: 145. ♀, ♂. N. syn. (R. E. Coville).
- Trypoxylon quintilis* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 206. ♂.
- Trypoxylon cockerellae* Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 130. ♀.
- Taxonomy: Evans, 1957. Amer. Ent. Soc., Trans. 83: 91, figs. 36-43 (larva). — Evans, 1959. Amer. Ent. Soc., Trans. 85: 160 (larva).
- Biology: Ashmead, 1894. Psyche 1: 45 (nest). — Rau and Rau, 1916. Jour. Anim. Behavior 6: 34, figs. 16, 19, 24, 25 (nest). — Rau and Rau, 1918. Wasp Studies Afield, pp. 135-137, fig. 32 (nest). — Rau, 1922. Acad. Sci. St. Louis, Trans. 24: 22 (nest). — Blackman and Stage, 1924. N. Y. State Col. Forestry, Syracuse Univ., Tech. Pub. 17: 196 (nest). — Rau, 1926. Acad. Sci. St. Louis, Trans. 25: 198 (nest). — Rau, 1928. Acad. Sci. St. Louis, Trans. 25: 406 (prey, life cycle). — Rau, 1931. Ent. News 42: 200 (homing experiments). — Muma and Jeffers, 1945. Ent. Soc. Amer., Ann. 38: 246, 252, 255, pl. 2, figs. 5, 6 (nest, prey). — Krombein, 1967. Trap-nesting wasps and bees, pp. 203-210, text fig. 2b, figs. 11, 133 (nest, prey, life cycle, egg, cocoon, parasites, predators).
- clavatum johannis* (Richards), n. status (R. E. Coville). Ga., Fla. Ecology: Nests in borings in wood, stores 8-17 spiders per cell. Parasite: *Amobia floridensis* (Tns.), *Miltogrammini* sp. Prey: *Lyssomanes viridans* (Hentz), *L. viridis* (Walck.); *Misumenops belthus* (Bks.), *M. celer* (Hentz), *M. sp.*, *Tmarus* sp., *Tibellus* sp., *Thomisidae* sp.; *Pellenes* sp., *Paraphidippus marginatus* (Walck.), *Phidippus audax* (Hentz), *P. variegatus* Luc., *P. clarus* Keys., *P. sp.*, *Icius* sp., *Hentzia ambigua* (Walck.), *H. palmarum* Hentz, *H. sp.*, *Maevia hobbsi* Barnes, *M. michelsoni* Barnes, *Thiodina sylvana* Hentz, *T. pseustes* Chamb. and Ivie; *Mimetes notius* Chamb.; *Pardosa* sp.; *Oxyopes salticus* Hentz, *O. sp.*, *Peucetia abbotti* (Walck.); *Gea heptagon* (Hentz), *Drexelia directa* (Hentz), *Eustala anastera* (Walck.), *Mangora placida* (Hentz), *Wagneriana tauricornis* Chamb., *Neoscona arabesca* (Walck.), *N. minima* (Keys.), *N. sp.*, *Argiope aurantia* Luc., *A. trifasciata* (Forsk.), *Araneidae* sp.; *Leucage venusta* (Walck.); prefers errant to snare-building spiders by a ratio of 3:1.
- Trypoxylon (Trypargilum) johannis* Richards, 1934. Roy. Ent. Soc. London, Trans. 82: 238. ♀, ♂.

Taxonomy: Evans, 1957. Amer. Ent. Soc., Trans. 83: 92, figs. 44-46 (larva). — Evans, 1959. Amer. Ent. Soc., Trans. 85: 160 (larva).

Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 210-214, text fig. 2c, fig. 52 (nest, prey, life cycle, egg, cocoon, parasites).

**saussurei** (Rohwer), n. comb. South. Ariz. south to Guanacaste Prov., Costa Rica. Ecology: Nests in old *Sceliphron* cells.

*Trypoxylon Mexicanum* Saussure, 1867. Reise d. Novara, Zool., v. 2, Hym., p. 78, pl. 4, fig. 45. ♀, ♂. Preocc.

*Trypoxylon saussurei* Rohwer, 1912. U. S. Natl. Mus., Proc. 41: 478. N. name.

Biology: Rau, 1943. Ent. Soc. Amer., Ann. 36: 649 (nest).

**spinosum** (Cameron). Tex. to Panama. Ecology: Nests in holes in masonry, crevices along tree trunk and in bamboo stems; stores 11-20 spiders per cell. Parasite: *Sarcophagidae* sp.

Prey: *Aysha decepta* Bks., *A. gracilis* (Hentz), *Anypaena* sp.; *Gea ergaster* (Walck.), *Neoscona* sp.; *Mimetes notius* Chamb.; *Peucetia viridans* (Hentz); *Hentzia palmarum* (Hentz), *Metaphidippus* sp., *Paraphidippus marginatus* (Walck.); *Misumenops oblongus* (Keys); *Uloborus glomerosus* Walck.; both adults and immatures are stored.

*Trypoxylon spinosum* Cameron, 1889. Biol. Cent.-Amer., Hym., v. 2, p. 46. ♀, ♂.

*Trypoxylon cinereo-hirtum* Cameron, 1889. Biol. Cent.-Amer., Hym., v. 2, p. 44. ♀.

Taxonomy: Evans, 1957. Amer. Ent. Soc., Trans. 83: 93, fig. 49 (larva).

Biology: Lin, 1969. Wasmann Jour. Biol. 27: 125-128 (nest, prey hunt, life cycle, egg, cocoon).

**texense** (Saussure). Ga., Fla., Ala. to Ill. west to N. Mex., Colo., S. Dak. Ecology: Nests in abandoned mud-dauber cells, old burrows of other arthropods in sand banks, and crevices in wooden or stone wall; stores 9-15 spiders per cell. Parasite: *Anthrax limatulus artemisia* Marst. Prey: *Oxyopes salticus* Hentz, *Peucetia viridis* (Walck.); *Neoscona arabesca* (Walck.), *Gea ergaster* (Walck.), *Argiope trifasciata* (Forsk.), *A. sp.*, *Eustala cepina* (Walck.), *Metepeira* sp., *Araneus cornutus* Clerck; *Tetragnatha pallens* Camb., *T. versicolor* Walck.; *Misumenops delphinus* (Walck.), *M. oblongus* (Keys), *Tibellus duttoni* (Hentz), *Xysticus* sp., *Philodromus* sp., *Misumena* sp.; *Zygoballus nervosus* Peckh., *Habronattus brunneus* (Peckh.), *Hentzia ambigua* (Walck.), *Marpissa pikei* (Peckh.), *Metaphidippus galathea* (Walck.), *Paraphidippus marginatus* (Walck.), *Phidippus audax* Hentz, *P. rimator* (Walck.); *Pardosa distincta* (Blackw.); *Mimetes* sp.; *Theridion intritum* Bish. and Cros., *T. murarium* Em.; *Rucinia* sp.; *Dendryphantus* sp.; stores both immatures and adults, and about equal numbers of errant and snare-building species.

*Trypoxylon texense* Saussure, 1867. Reise d. Novara, Zool. 2, Hym., p. 77. ♀.

*Trypoxylon sulcus* La Munyon, 1877. Nebr. Assoc. Adv. Sci., Proc., March 8.

*Trypoxylon aureolum* Rohwer, 1909. Ent. News 20: 381. ♀, ♂.

*Trypoxylon relativum* Rohwer, 1909. Ent. News 20: 382. ♀.

Taxonomy: Evans, 1959. Amer. Ent. Soc., Trans. 85: 159 (larva).

Biology: Hartman, 1905. Tex. Acad. Sci., Trans. 7: 71-73, pl. 4, fig. 23 (nest, prey).

—Hungerford and Williams, 1912. Ent. News 23: 248, fig. 5 (nest, prey). —Rau, 1928.

Acad. Sci. St. Louis, Trans. 25: 441 (nest). —Rau, 1940. Ent. Soc. Amer., Ann. 33: 592

(nest). —Evans, 1959. Amer. Ent. Soc., Trans. 85: 159 (nest). —Kuczewski, 1963. Fla. Ent. 46: 243-245 (nest, prey, egg). —Lin, 1969. Wasmann Jour. Biol. 27: 128-129 (nest, prey).

**xantianum** (Saussure), n. comb. South. Calif.; Mexico (Baja California).

*Trypoxylon xantianum* Saussure, 1867. Reise d. Novara, Zool., v. 2, Hym., p. 78. ♂, ♀.

#### SPECIES GROUP PUNCTULATUM

**lactitarse** (Saussure). Ont. and Mass. to Fla., west to Wis., Tex. and Ariz., south to Argentina.

Ecology: Nests in borings of other insects in dead wood and structural timber, in trap nests, in old mud dauber nests, and in old burrows of mining bees. Parasite: *Amobia aurifrons* (Tns.), *A. distorta* (Allen), *Senotainia* sp. in *trilineata* (Wulp) complex; *Anthrax a. argyropygus* Wied., *A. aterrimus* (Big.); *Megaselia* sp.; *Tyrophagus* sp.; *Melittobia chalybii* Ashm.; *Trichrysis carinata* (Say); *Sphaerophthalma pennsylvanica*

*scaeva* (Bl.). Prey: *Clubiona obesa* Hentz, *C. pallens* Hentz; *Ayscha gracilis* (Hentz), *Anypaena celer* (Hentz), *A. fraterna* (Bks.), *A. pectorosa* Koch; *Philodromus washita* Bks., *P. infuscatus* Keys., *P. praelustris* Keys., *P. rufus* (Walck.), *P. pernix* Blackw., *P. spp.*; Salticidae sp.; *Pisaurina mira* (Walck.), *P. sp.*; *Mimetes puritanus* Chamb.; *Wixia ectypa* (Walck.), *Eustala anastera* (Walck.), *E. emertoni* Bks., *Acacesia hamata* (Hentz), *Mangora gibberosa* (Hentz), *M. maculata* (Keys.), *Neoscona arabesca* (Walck.), *N. domiciliorum* (Hentz), *N. minima* Camb., *N. spp.*, *Araneus juniperi* (Em.), *A. patagiatus* Clerck, *A. marmoreus* Clerck, *A. spp.*, *Araniella displicata* Hentz, *Neosconella pegnia* (Walck.), *Argiope trifasciata* (Forsk.), *Conepeira glyphica* Archer, Araneidae spp.; *Theridion differens* (Em.), *T. murarium* (Em.); *Poecilochroa capulata* (Walck.); snare-building spiders are preferred to errant by ratio of 13: 1. Predator: *Trogoderma ornatum* Say; *Lecontella cancellata* (LeC.).

*Trypoxylon lactitarse* Saussure, 1867. Reise d. Novara, Zool., v. 2, Hym., p. 81. ♂.  
*Trypoxylon striatum* Provancher, 1888. Addit. Corr. Faune Ent. Canada Hym., p. 283. ♀.  
*Trypoxylon cinereum* Cameron, 1889. Biol. Cent.-Amer., Hym., v. 2, p. 40. ♀, ♂.  
*Trypoxylon albopilosum* Fox, 1891. Amer. Ent. Soc., Trans. 18: 139. ♀, ♂.  
*Trypoxylon albopilosum planoense* Rohwer, 1909. Ent. News 20: 380. ♀.

Taxonomy: Evans, 1957. Amer. Ent. Soc., Trans. 83: 94, fig. 55 (larva). — Evans, 1959. Amer. Ent. Soc., Trans. 85: 161 (larva). — Menke, 1974. Ent. Soc. Wash., Proc. 76: 418 (identity of *lactitarse* Sauss.).

Biology: Peckham and Peckham, 1895. Psyche 7: 303 (nest, prey, male behavior in nest). — Peckham and Peckham, 1898. Wis. Geol. Nat. Hist. Survey, Bul. 2: 77-87 (nest, prey, male behavior in nest). — Rau, 1926. Acad. Sci. St. Louis, Trans. 25: 199 (nest). — Rau, 1928. Acad. Sci. St. Louis, Trans. 25: 423 (nest, prey). — Krombein, 1956. Ent. Soc. Wash., Proc. 58: 155-156 (nest, prey). — Balduf, 1961. Brooklyn Ent. Soc., Bul. 56: 82-83 (nest). — Krombein, 1967. Trap-nesting wasps and bees, pp. 214-222, text fig. 2e, figs. 53-56, 132, 134, 135 (nest, prey, life cycle, egg, cocoon, parasites, predator). — Medler, 1967. Amer. Midland Nat. 78: 344-358 (nest, prey, cocoon, parasites, life cycle).

#### SPECIES GROUP NITIDUM

Members of this group prey entirely upon snare-building spiders.

**collinum collinum** (Smith). Ga., Fla. Ecology: Nests in cavities in twigs and in trap nests, stores 13-25 spiders per cell. Parasite: *Anthrax a. argyropygus* Wied.; Phoridae sp.; *Trichrysis carinata* (Say). Prey: *Theridion flavonotatum* Beck., *T. glaucescens* Beck.; *Eustala anastera* (Walck.), *E. triflex* (Walck.), *Acacesia folifera* (Marx), *A. hamata* (Hentz), *Neoscona minima* Camb., *N. spp.*, *Araneus juniperi* (Em.), *Conarana floridensis* Bks., *C. sp.*, *Neosconella pegnia* (Walck.), Araneidae spp. Predator: *Crematogaster* sp.

*Trypoxylon collinum* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 381. ♀.

Taxonomy: Evans, 1959. Amer. Ent. Soc., Trans. 85: 160 (larva).

Biology: Krombein, 1964. Amer. Mus. Novitates 2201: 18 (nest). — Krombein, 1967. Trap-nesting wasps and bees, pp. 185-187 (nest, prey, life cycle, cocoon, parasites, predator). — Krombein, 1970. Smithsn. Contrib. Zool. 46: 22-26, figs 62-78 (nesting behavior, prey, life cycle).

**collinum rubrocinctum** (Packard). Que. to Ga., west to Minn., Kans., Nev. Ecology: Nests in cavities in twigs, trap nests, abandoned beetle borings, hollow straws, and in crevices in mortar; stores 5-27 spiders per cell. Parasite: *Anthrax a. argyropygus* Wied., *A. aterrimus* (Big.); *Megasela* sp.; Miltogramminae sp.; *Sphaerophthalma pensylvanica* scaeva (Bl.); *Trichrysis carinata* (Say), *T. doriae* (Grib.), *Chrysis pellucidula* Aar., *C. sp.*; *Mesatoporus compressicornis* Cush. Prey: *Conopistha* sp., *Theridula opulenta* (Walck.), *Theridion lyricum* Walck., *T. murarium* Em., *T. spirale* Em., *T. flavonotatum* Beck., *T. lyra* Hentz, *T. alabamense* Gertsch and Archer, *T. albidum* (Bks.), *T. differens* (Em.), *T. spp.*, *Argyrodes* sp., Theridiidae spp.; *Eustala anastera* (Walck.), *E. emertoni* Bks., *E. spp.*, *Cyclosa conica* (Pall.), *Neoscona arabesca* (Walck.), *N. spp.*, *Araneus attester* Petrunk., *A. juniperi* (Em.), *A. trifolium* (Hentz), *A. spp.*, *Argiope aurantia*

Luc., *A. trifasciata* (Forsk.), *Mangora gibberosa* (Hentz), Araneidae spp.; *Linyphia clathrata* Sund., *L. sp.*; *Leucauge venusta* (Walck.).

*Trypoxylon rubro-cinctum* Packard, 1867. Ent. Soc. Phila., Proc. 6: 416. ♀.

Taxonomy: Evans, 1957. Amer. Ent. Soc., Trans. 83: 94, fig. 63 (larva). — Evans, 1959. Amer. Ent. Soc., Trans. 85: 161 (larva).

Biology: Peckham and Peckham, 1895. Psyche 7: 303 (nest, prey, life cycle). — Peckham and Peckham, 1898. Wis. Geol. Nat. Hist. Survey, Bul. 2: 77-84 (nest, prey, life cycle).

— Peckham and Peckham, 1905. Wasps, social and solitary, pp. 178-193, 2 figs. (nest, prey, male behavior in nest). — Rau, 1922. Acad. Sci. St. Louis, Trans. 24: 22 (nest, parasite).

— Krombein, 1954. Brooklyn Ent. Soc., Bul. 49: 5 (nest, prey). — Krombein, 1967.

Trap-nesting wasps and bees, pp. 187-193, text fig. 2a, figs. 126, 135-139 (nest, prey, life cycle, cocoon, parasites). — Medler, 1967. Amer. Midland Nat. 78: 344-358 (nest, prey, cocoon, parasites, life cycle).

**orizabense** (Richards), n. comb. South. Ariz.; Mexico (Orizaba).

*Trypoxylon (Trypargilum) orizabense* Richards, 1934. Roy. Ent. Soc. London, Trans. 82: 273. ♀, ♂.

**tridentatum archboldi** (Krombein). Fla. Ecology: Nests in borings in wood, stores 9-36 spiders per cell. Parasite: *Anthrax a. argyropygus* Wied., *Lepidophora lepidocera* (Wied.) ?; *Pyemotes ventricosus* (Newp.). Prey: *Mimetus* sp.; *Gea heptagon* (Hentz), *Drezelia directa* (Hentz), *Eustala anastera* (Walck.) *Larinia directa* (Hentz), *Singa* sp., *Neoscona arabesca* (Walck.), *N. sp.*, *Conaranaea floridensis* Bks., *C. sp.*, Araneidae spp.; *Theridula quadripunctata* Keys., *Theridion flavonotatum* Beck., *Chrysso clementinae* (Petrunck.), *Theridiidae* spp.

*Trypoxylon (Trypargilum) tridentatum archboldi* Krombein, 1959. Ent. Soc. Wash., Proc. 61: 150. ♀, ♂.

Biology: Krombein, 1959. Ent. Soc. Wash., Proc. 61: 151-152 (nest, prey, cocoon). — Krombein, 1967. Trap-nesting wasps and bees, pp. 200-202 (nest, prey, life cycle, cocoon, parasites).

**tridentatum tridentatum** (Packard). Conn. to Fla., west to B. C. and Calif. Ecology: Nests in *Sambucus* and white sage stems, borings in wood and old mud dauber nests. Parasite: *Trichrysis mucronata* (Br.), *T. deversor* Boh., *Ceratochrysis antyga* Boh., *Chrysis pellucidula* Aar.; *Sphaerophthalma uro* (Bl.), *S. amphion* (Fox), *S. abdominalis* (Bl.); *Tetrastichus* sp.; *Amobia floridensis* (Tns.), *A. spp.* ?; *Bombiliidae* sp.; *Pyemotes ventricosus* (Newp.). Prey: *Latrodectus mactans* (F.), *Theridion murarium* Em., *T. dilutum* Levi, *T. sp.*; *Mimetus hesperus* Chamb.; *Eustala rosae* Chamb. and Ivie, *E. sp.*, *Meteteira arizonica* Chamb. and Ivie, *M. sp.*, *Neoscona vertebrata* (McCook), *N. sp.*, *Araneus* sp., *Acanthepeira stellata* (Walck.), *Cyclosa conica* (Fall.), Araneidae spp.

*Trypoxylon tridentatum* Packard, 1867. Ent. Soc. Phila., Proc. 6: 417. ♀.

*Trypoxylon projectum* Fox, 1891. Amer. Ent. Soc., Trans. 18: 141. ♀, ♂.

Taxonomy: Evans, 1957. Amer. Ent. Soc., Trans. 83: 93, figs. 50-52 (larva). — Evans, 1959. Amer. Ent. Soc., Trans. 85: 161 (larva).

Biology: Rau and Rau, 1918. Wasp Studies Afield, p. 134 (nest, life cycle). — Blackman and Stage, 1924. N. Y. State Col. Forestry, Syracuse Univ., Tech. Pub. 17: 196-197 (nest).

— Rau, 1934. Canad. Ent. 66: 259 (nest, parasite). — Hicks, 1934. Colo. Univ., Studies 21: 267 (nest, parasite). — Parker and Bohart, 1966. Pan-Pacific Ent. 42: 95 (nest, parasites).

— Krombein, 1967. Trap-nesting wasps and bees, pp. 193-200, text fig. 2d, figs. 115-118 (nest, prey, life cycle, egg, cocoon, parasites). — Paetzel, 1973. Pan-Pacific Ent. 49: 26-30, 3 figs. (male behavior in nest, mating; misd. as *rubrocinctum*). — Paetzel, 1973. Outdoor World 6 (2): 42-45, 4 figs. (nest, prey, life cycle, male behavior in nest; misd. as *rubrocinctum*).

#### SPECIES GROUP ALBITARSE

**politum** (Say). Mass. to Fla. west to Kans. and Tex. Ecology: Builds linear series of mud cells in parallel rows resembling pipes of an organ, stores 3-18 prey per cell. Parasite: *Vidia* sp.; *Anthrax limatus* fur (O. S.), *A. aterrimus* (Big.); *Amobia aurifrons* (Tns.), *A. distorta* (Allen), *Helicobia rapax* Wlkr., *Scutainia* sp.; *Sphaerophthalma p. pennsylvanica*

(Lep.), *S. p. scaeva* (Bl.), *Dasymutilla v. vesta* (Cr.); *Melittobia chalybii* Ashm.; *Trichrysis tridens* (Lep.). Prey: *Neoscona minima* Keys., *N. benjamina* Walck., *N. spp.*, *Eustala anastera* (Walck.), *Wixia ectypa* (Walck.), *Aranea* spp.; Theridiidae spp.; preys upon adults and immatures. Because of its nest this wasp is popularly known as the pipe-organ wasp.

*Trypoxylon politus* Say, 1837. Boston Jour. Nat. Hist. 1: 373.

*Trypoxylon neglectum* Kohl, 1884. Zool.-Bot. Gesell. Wien, Verh. 33: 340. ♂.

*Trypoxylon basale* Rohwer, 1912. U. S. Natl. Mus., Proc. 41: 475. ♀, ♂.

*Trypoxylon politiforme* Rohwer, 1912. U. S. Natl. Mus., Proc. 41: 476. ♀, ♂.

Taxonomy: Evans, 1957. Amer. Ent. Soc., Trans. 83: 95, fig. 62 (larva). — Evans, 1959. Amer. Ent. Soc., Trans. 85: 161 (larva).

Biology: Rau, 1913. Ent. News 24: 401 (larval feeding). — Rau and Rau, 1916. Jour. Anim. Behavior 6: 31-35, fig. 5 (nest, prey, male behavior in nest). — Rau, 1928. Acad. Sci. St. Louis, Trans. 25: 428-439, figs. 57-62 (nest, prey, life cycle, male behavior in nest, cocoon, parasites). — Osborne, 1929. Conn. Agr. Expt. Sta., Bul. 305: 751-753, 1 pl., 1 fig. — Dow, 1930. Brooklyn Ent. Soc., Bul. 25: 98-101 (nest). — Fattig, 1936. Canad. Ent. 68: 44 (nest, prey). — Hartman, 1944. Ent. News 55: 7 (prey). — Rau, 1944. Ent. News 55: 9 (prey hunt). — Muma and Jeffers, 1944. Ent. News 55: 50 (nest). — Muma and Jeffers, 1945. Ent. Soc. Amer., Ann. 38: 246, 252, 254-255, figs. 3, 4 (nest, prey). — Lin, 1969. Wasmann Jour. Biol. 27: 129-130 (prey). — Johnson, 1974. Ent. Soc. Wash., Proc. 76: 448-449 (parasite). — Cross, Stith and Bauman, 1975. Ent. Soc. Amer., Ann. 68: 901-916, 10 figs. (mating, nest construction and provisioning, prey hunting, cocoon, life history, parasites).

Morphology: Snodgrass, 1941. Smithsn. Inst., Misc. Collect. 99 (14): pl. 21, figs. L, Q, R (male genitalia).

#### SUBFAMILY BOTHYNOSTETHINAE

##### Genus BOTHYNOSTETHUS Kohl

*Bothynostethus* Kohl, 1884. Zool.-Bot. Gesell. Wien, Verhandl. 33: 344.

Type-species: *Bothynostethus Saussurei* Kohl. Monotypic.

*distinctus* Fox. N. Y. to Fla. west to Idaho and Ariz. Ecology: Nests in sand, occasionally utilizing a rodent burrow, makes up to 8 cells per nest, stores 4-9 chrysomelid beetles per cell. Parasite: *Senotainia* sp. ? Prey: *Monoxia* sp., *Pyrrhalla decora* (Say), *P. perplexa* Fall., *P. spiraeae* Fall., *P. cavicollis* (LeC.), *Ophraella notata* (F.).

*Bothynostethus distinctus* Fox, 1891. Ent. News 2: 31. ♀, ♂.

Taxonomy: Kurczewski and Evans, 1972. Psyche 79: 97-99, figs. 8-15 (larva).

Biology: Cazier and Mortenson, 1965. Pan-Pacific Ent. 41: 31-32 (nest, prey). — Kurczewski and Evans, 1972. Psyche 79: 88-97, figs. 1-7 (nest, prey transport, cocoon, parasites).

#### Family CRABRONIDAE

Taxonomy: Evans, 1957. Amer. Ent. Soc., Trans. 83: 99-113, figs. 69-115 (larvae). — Evans, 1959. Amer. Ent. Soc., Trans. 85: 162-165, figs. 43-53, 61 (larvae). — Evans, 1964. Amer. Ent. Soc., Trans. 90: 289-296, figs. 104-114 (larvae).

#### SUBFAMILY OXYBELINAE

So far as known all species nest in the ground making uni- or multicellular nests and preferring rather friable soil.

Taxonomy: Pate, 1940. Amer. Ent. Soc., Trans. 66: 3-5 (group characters and key to world genera).

##### Genus BELOMICRUS Costa

*Belomicrus* Costa, 1871 (1866). R. Univ. Napoli Mus. Zool., Ann. 6: 80.

Type-species: *Belomicrus italicus* Costa. Monotypic.

*Oxybeloides* Radoszkowski, 1877. In Fedtschenko, Reise in Turkestan, Imp. Obschch. Moskva Izv. 26 (1): 68.

Type-species: *Oxybeloides fasciatus* Radoszkowski. Monotypic.

*Oxybelomorpha* Brauns, 1896. In Kohl, K. K. Naturhist. Hofmus., Ann. 11: 475.

Type-species: *Oxybelomorpha Kohlii* Brauns. Monotypic.

*Belomicrus* subg. *Nototis* Arnold, 1927. Transvaal Mus., Ann. 12: 64.

Type-species: *Belomicrus (Nototis) bicornutus* Arnold. Monotypic.

*Belomicrus* subg. *Pseudoxybelus* Gussakovskij, 1933. Akad. Nauk S. S. R., Zool. Inst., Trudy 1: 286.

Type-species: *Belomicrus (Pseudoxybelus) persa* Gussakovskij. Monotypic.

Scanty information is available on the biology of five species, two of which have been reported to construct multicellular nests with up to 4 cells per nest. Three North American species prey upon nymphal or adult mirid bugs; one North American and one European species prey upon adult mealyrid beetles.

Revision: Pate, 1940. Amer. Ent. Soc., Trans. 66: 11-96, 209-257, 55 figs. (N. Amer. spp.)  
**apache** Pate. N. Mex., Ariz.

*Belomicrus apache* Pate, 1940. Amer. Ent. Soc., Trans. 66: 15. ♀.

**bridwelli** Pate. Va., Tenn., Fla.

*Belomicrus bridwelli* Pate, 1940. Amer. Ent. Soc., Trans. 66: 93. ♂, ♀.

**cahuilla** Pate. Calif.

*Belomicrus cahuilla* Pate, 1940. Amer. Ent. Soc., Trans. 66: 39. ♂.

**cladothricis** (Cockerell). Tex. to Calif., Nev., Idaho; Mexico (Baja California).

*Oxybelus cladothricis* Cockerell, 1895. Canad. Ent. 27: 309. ♂, ♀.

*Belomicrus cladothricis prosopidis* Pate, 1940. Amer. Ent. Soc., Trans. 66: 72. ♂, ♀.

*Belomicrus minidoka* Pate, 1940. Amer. Ent. Soc., Trans. 66: 79. ♂.

**coloratus** Baker. Idaho, Nev., Calif. Prey: Miridae sp. nymphs.

*Belomicrus colorata* Baker, 1909. Pomona Col., Jour. Ent. 1: 29. ♀.

Biology: Bohart and Menke, 1976. Sphecid wasps of world, p. 363 (prey).

**cookii** Baker. Calif.

*Belomicrus Cookii* Baker, 1909. Pomona Col., Jour. Ent. 1: 29. ♂, ♀.

**cucamonga** Pate. Wash., Calif.

*Belomicrus cucamonga* Pate, 1940. Amer. Ent. Soc., Trans. 66: 76. ♀.

**eriogoni** Pate. Calif., Oreg., Nev., Utah.

*Belomicrus cladothricis eriogoni* Pate, 1940. Amer. Ent. Soc., Trans. 66: 70. ♂, ♀.

**forbesii** (Robertson). Colo. and Wyo. north to Man. and west to B. C. and Calif. Ecology: Nests in compact, sandy-clay soil sometimes mixed with gravel, makes 4-8 cells per nest, stores 5-13 prey per cell. Parasite: *Senotainia trilineata* (Wulp). Prey: *Orectoderes obliquus* Uhl. nymphs and a few adults, Miridae sp. nymphs. Predator: *Philaanthus pulcher* D. T.

*Oxybelus Forbesii* Robertson, 1889. Amer. Ent. Soc., Trans. 16: 85. ♂.

*Oxybelus (Oxybeloides) columbianus* Kohl, 1892. K. K. Naturhist. Hofmus., Ann. 7: 208. ♂, ♀.

*Belomicrus larimerensis* Rohwer, 1908. Ent. News 19: 417. ♀.

Taxonomy: Evans, 1969. Kans. Ent. Soc., Jour. 42: 123-124, figs. 6-9 (larva).

Biology: Evans, 1969. Kans. Ent. Soc., Jour. 42: 122-123, fig. 5 (nest, prey transport).

**franciscus** Pate. Calif. Ecology: Nests in sand. Prey: *Trichochrous antennatus* Mots. adults.

*Belomicrus franciscus* Pate, 1931. Ent. News 42: 77. ♂, ♀.

*Belomicrus quemaya* Pate, 1940. Amer. Ent. Soc., Trans. 66: 47. ♂.

Biology: Williams, 1936. Pan-Pacific Ent. 12: 3-6 (nest, prey).

**istam** Pate. Calif.

*Belomicrus istam* Pate, 1940. Amer. Ent. Soc., Trans. 66: 81. ♂, ♀.

**jurumpa** Pate. Calif.

*Belomicrus jurumpa* Pate, 1940. Amer. Ent. Soc., Trans. 66: 53. ♂, ♀.

**maricopa** Pate. Ariz., N. Mex.

*Belomicrus maricopa* Pate, 1947. Ent. Soc. Wash., Proc. 49: 54. ♀.

**mescalero** Pate. Calif., N. Mex.

*Belomicrus mescalero* Pate, 1940. Amer. Ent. Soc., Trans. 66: 87. ♀.

**mono** Pate. Calif.

*Belomicrus serrano mono* Pate, 1940. Amer. Ent. Soc., Trans. 66: 46. ♀.

**pachappa** Pate. Calif.

*Belomicrus pachappa* Pate, 1940. Amer. Ent. Soc., Trans. 66: 73. ♀.

**penuti** Pate. Calif., Nev., Oreg. Prey: *Miridae* sp. nymphs.

*Belomicrus forbesii penuti* Pate, 1940. Amer. Ent. Soc., Trans. 66: 27. ♂, ♀.

Biology: Bohart and Menke, 1976. Sphecids of world, p. 363 (prey).

**potawatomi** Pate. Iowa.

*Belomicrus potawatomi* Pate, 1947. Ent. Soc. Wash., Proc. 49: 57. ♀.

**querecho** Pate. N. Mex.

*Belomicrus querecho* Pate, 1940. Amer. Ent. Soc., Trans. 66: 36. ♂.

**sechi** Pate. South. Calif.

*Belomicrus sechi* Pate, 1940. Amer. Ent. Soc., Trans. 66: 60. ♂.

**serrano** Pate. Calif.

*Belomicrus serrano serrano* Pate, 1940. Amer. Ent. Soc., Trans. 66: 42. ♂, ♀.

**timberlakei** Pate. Calif.

*Belomicrus timberlakei* Pate, 1940. Amer. Ent. Soc., Trans. 66: 91. ♂.

**tuktum** Pate. Calif.

*Belomicrus tuktum* Pate, 1940. Amer. Ent. Soc., Trans. 66: 84. ♂.

**vanyume** Pate. Calif.

*Belomicrus vanyume* Pate, 1940. Amer. Ent. Soc., Trans. 66: 17. ♀.

**vierecki** Pate. Calif., N. Mex.; Mexico (Baja California, Puebla).

*Belomicrus vierecki* Pate, 1940. Amer. Ent. Soc., Trans. 66: 56. ♂, ♀.

#### Genus ENCHEMICRUM Pate

*Enchemicrum* Pate, 1929. Ent. News 40: 219.

Type-species: *Enchemicrum australe* Pate. Orig. desig.

The genus contains only one species.

Revision: Pate, 1940. Amer. Ent. Soc., Trans. 66: 257-264.

**australe** Pate. Ga. to Ariz. north to Okla. and Ill. Ecology: Makes multicellular nest in firmly packed sand, stores 12-16 flies per cell. Prey: *Paralimna texana* Cr., *Zeros flavipes* Cr.; *Medetera californiensis* Whlr. Predator: *Iridomyrmex pruinosus analis* (Andre), *Dorymyrmex pyramicus* (Rog.).

*Enchemicrum australe* Pate, 1929. Ent. News 40: 220. ♂, ♀.

Biology: Bohart and Holland, 1966. Pan-Pacific Ent. 42: 161 (nest, prey, predators).

#### Genus OXYBELUS Latreille

*Oxybelus* Latreille, 1796. Precis Caract. Gen. Ins., p. 129. No species.

Type-species: *Crabro uniglumis* of Fabricius. First included species.

*Notoglossa* Dahlbom, 1845. Hym. Europaea, v. 1, p. 514.

Type-species: *Notoglossa sagittata* Dahlbom. Monotypic.

*Alepidaspis* Costa, 1882. Accad. delle Sci. Fis. e Mat. Napoli, Atti 9 (11): 35.

Type-species: *Alepidaspis diphylus* Costa. Monotypic.

*Oxybelus* subg. *Anoxybelus* Kohl, 1923. Konowia 2: 274.

Type-species: *Oxybelus (Anoxybelus) Maidlii* Kohl. Monotypic.

*Gonioxybelus* Pate, 1937. Amer. Ent. Soc., Mem. 9: 28.

Type-species: *Oxybelus nigripes* Olivier. Orig. desig.

*Orthoxybelus* Pate, 1937. Amer. Ent. Soc., Mem. 9: 45.

Type-species: *Vespa uniglumis* Linnaeus. Orig. desig.

*Latroxybelus* Noskiewicz and Chudoba, 1950. Polskie Pismo Ent. 19: 300.



Type-species: *Oxybelus latro* Olivier. Monotypic.

Bohart and Schlinger (1957) recognized six species groups in the Nearctic fauna. However, Peckham, Kurczewski and Peckham (1973) reported that some ethological information is not in concordance with this classification. It seems preferable not to recognize species groups at this time pending further systematic studies based on both morphology and ethology.

The majority of species nest in easily friable soil such as sand, and construct uni- or multicellular nests. Adult Diptera are preyed upon, some species using flies as large as themselves, others much smaller kinds. The prey is transported in flight either impaled on the sting or carried by the legs; some species which carry the prey with their legs may land and impale the prey on the sting before entering the nest. A number of species store mostly male flies, and a few are known to prey upon males only. The cell may be stored with as few as 2 flies or as many as 38, depending upon the species of wasp.

Taxonomy: Robertson, 1889. Amer. Ent. Soc., Trans. 16: 77-85. — Mickel, 1918 (1917). Nebr.

Univ. Studies 17: 44-51 (Nebr. spp.). — Bohart and Schlinger, 1956. Pan-Pacific Ent. 32: 157-165 (annotated synonymical list of N. Amer. spp.). — Bohart and Schlinger, 1957. Calif. Ins. Survey, Bul. 4: 103-142, 23 maps, 93 figs. (descr. of Calif. spp. and key to N. Amer. spp.).

Biology: Bohart, Lin and Holland, 1966. Ent. Soc. Amer., Ann. 59: 820 (prey records of N. Amer. spp.). — Peckham, Kurczewski and Peckham, 1973. Ent. Soc. Amer., Ann. 66: 658-660 (ethology of N. Amer. spp.).

**abdominalis** Baker. U. S. west of 100th meridian, north to Idaho, Nebr.; north, Mexico.

*Oxybelus abdominalis* Baker, 1896. Ent. News 7: 158. ♂.

*Notolossa calligaster* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 214. ♀.

**argenteopilosus** Cameron. West. N. Amer. from Colo. and Oreg. south to Mexico (Tehuantepec).

*Oxybelus argenteopilosus* Cameron, 1891. Biol. Cent.-Amer., Hym., v. 2, p. 158, pl. 9, figs. 23, 23a. ♀.

**argyphus** Bohart and Schlinger. Calif., Ariz., south, Colo.

*Oxybelus argyphus* Bohart and Schlinger, 1956. Biol. Soc. Wash., Proc. 69: 38. ♀.

**bipunctatus** Olivier. Maine to Va.; Europe, Japan. Ecology: Nests in sand, makes 1-4 cells per nest, stores 2-12 prey per cell. Apparently adventive from Europe in 1935.

Parasite: *Phrosinella fulvicornis* (Coq.), *Senotainia trilineata* (Wulp), Sarcophagidae spp. Prey: *Allognosta fuscitarsis* (Say), *Caloparyphus tetraspilus* (Lw.), *Euparyphus stigmatalis* Lw., *Microchrysa polita* (L.), *Nemotelus nigrinus* Fall., *Oxycera picta* Wulp, *O. variegata* Oliv., *Sargus decorus* Say; *Chrysopilus quadratus* (Say), *Symphoromyia* sp.; *Psilocephala Haemorrhoidalis* (Macq.); *Diaphorus pseudopacus* Robinson; *Callomyia venusta* Snow, *Platypeza anthrax* Lw.; *Pipunculus* sp.; *Chrysogaster inflatiformis* Shann., *C. nigripes* Lw., *Heringia salax* (Lw.), *Neocnemodon elongatus* (Curr.), *Platycheirus erraticus* Curr.; *Lonchaea nudifemorata* Mall., *L.* spp.; *Phleomyia indecora* (Lw.); *Hylemya florilega* (Zett.), *H. fugax* (Meig.), *H. platura* (Meig.), *H. cilicrura* (Rond.), *H.* sp.; *Azelia* sp., *Fannia canicularis* (L.), *F. coracina* (Lw.), *F. depressa* (Stein), *F. manicata* (Meig.), *F. nidicola* Mall., *F. sociella* (Zett.), *Gymnodia cilifera* (Mall.), *Hebecnema vespertina* (Fall.), *Hydrotaea armipes* (Fall.), *H. basdeni* Coll., *H. occulta* (Meig.), *Spilogona* sp.; *Melanomyia* sp.; *Metopia argyrocephala* (Meig.); *Altophorella aeneiventris* (Will.), *A. fumosa* (Coq.), *A. pulverea* (Coq.), *Hyalomyia purpurascens* (Tns.), *Hyalomyia triangulifer* (Lw.); prey consists of male Brachycera and Cyclorrhapha, rarely females of latter. Another subsp. occurs in the Mediterranean area.

*Oxybelus bipunctatus* Olivier, 1811. Encycl. Meth. Ins., v. 8, p. 597. ♀.

*Oxybelus nigroaeneus* Shuckard, 1837. Essay on Indig. Fossor. Hym., p. 113. ♂.

*Oxybelus laevigatus* Schilling, 1848. Schles. Gesell. f. Vaterland. Kult. Arb. im Jahre 1847, p. 105.

Taxonomy: Evans, 1957. Amer. Ent. Soc., Trans. 83: 111, figs. 107-115 (larva).

Biology: Pate, 1946 (1945). Brooklyn Ent. Soc., Bul. 40: 165 (prey). — Krombein, 1948. Ent. Soc. Wash., Proc. 50: 67 (nest, prey). — Krombein, 1956. Brooklyn Ent. Soc., Bul. 51: 43

- (prey). —Kurczewski and Harris, 1968. N. Y. Ent. Soc., Jour. 76: 81-83 (nest, parasites).  
 —Peckham, Kurczewski and Peckham, 1973. Ent. Soc. Amer., Ann. 66: 647-651, figs. 1, 3-7 (nest, prey transport, egg, mating, parasites).
- californicus** Bohart and Schlinger. West. U. S. and north. Mexico.  
*Oxybelus californicus* Bohart and Schlinger, 1956. Pan-Pacific Ent. 32: 147. ♂, ♀.
- canalis** Bohart and Schlinger. Southwest. U. S., north to Utah; north. Mexico.  
*Oxybelus canalis* Bohart and Schlinger, 1956. Pan-Pacific Ent. 32: 149. ♂, ♀.
- cochise** Pate. Calif., Ariz., N. Mex., Tex.; Mexico (Chihuahua, Baja California).  
*Oxybelus cochise* Pate, 1943. Brooklyn Ent. Soc., Bul. 38: 93. ♂.
- cocopa** Pate. Calif.  
*Oxybelus cocopa* Pate, 1943. Pan-Pacific Ent. 19: 121. ♂.
- cornutus** Robertson. U. S. west of 100 degrees W., Montana south to Mexico (Guadalajara).  
*Oxybelus cornutus* Robertson, 1889. Amer. Ent. Soc., Trans. 16: 80. ♂.  
*Oxybelus quadricolor* Cockerell and Baker, 1896. Psyche 7 (sup.): 21. ♀.  
*Oxybelus polygoni* Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 116. ♀.
- crandalli** Bohart and Schlinger. Ariz., Ark.  
*Oxybelus crandalli* Bohart and Schlinger, 1956. Pan-Pacific Ent. 32: 154. ♀.
- cressonii** Robertson. Centr. U. S., Utah, and Tex., east to Va., north to Mich. Ecology: Makes unicellular nest in sand, stores 10-15 prey per cell. Prey: *Neopachygaster maculicornis* (Hine); *Thaumatomyia bistrata* (Wlkr.); *Coelotanyus scapularis* (Lw.).  
*Oxybelus Cressonii* Robertson, 1889. Amer. Ent. Soc., Trans. 16: 83. ♀.
- Biology: Krombein, 1948. Ent. Soc. Wash., Proc. 50: 67 (prey). —Kurczewski, 1972. Kans. Ent. Soc., Jour. 45: 398-400, fig. 1a, b (nest, prey transport).
- decorosus** (Mickel). U. S. east of 100 degrees W., Vt. and Minn., south to Fla.  
*Notoglossa decorosa* Mickel, 1916. Amer. Ent. Soc., Trans. 42: 430. ♀.
- emarginatus** Say. U. S. and south. Canada, Mexico south nearly to Mexico City. Ecology: Usually makes unicellular nest in sand, occasionally a 2-celled nest, stores 4-38 prey per cell. Parasite: Diptera spp., Miltogrammini sp. ? Prey: *Anarete buscki* (Felt), *Lestremia* sp.; *Chironomus* sp.; *Chaoborus punctipennis* Say; *Culicoides stellifer* (Coq.); *Simulium* sp. in jenningsi Mall. group; *Microchrysa polita* (L.); *Syneches simplex* Wlkr.; *Chrysotus obliquus* Lw., *C. pomeroyi* Parent, C. spp., *Condylotylus caudatus* (Wied.), *C. flavipes* (Ald.), *C. nigrofemoratus* (Wlkr.), *C. patibulatus* (Say), *Diaphorus gibbosus* Van D., *D. similis* Van D., *Gymnopternus exilis* Lw., G. spp., *Medetera veles* Lw., *M. vittata* Van D., M. sp., *Neurigona lateralis* (Say); *Pipunculus* sp.; *Mesograpta marginata* (Say), *Toxomerus geminatus* (Say); *Euxesta notata* (Wied.); *Amphicnephes pullus* (Wied.), *Rivellia variabilis* Lw., *R. winifredae* Namba, R. sp.; *Euaesta bella* (Lw.); *Sepsis punctum* (F.); *Campoprosopella borealis* Shew., *Lyciella annulata* (Mel.), L. sp., *Minettia lupulina* (F.); *Leptocera ferruginata* (Sten.), L. *Pararorialis* Duda, L. sp.; *Desmometopa sordida* (Fall.), *D. tarsalis* Lw., *Leptometopa latipes* (Meig.), *Madiza glabra* Fall., *P. indecora* (Lw.); *Notiphila* sp.; *Drosophila busckii* Coq., *D. robusta* Sturt., D. sp., *Scaptomyza pallida* (Zett.); *Conioscinella minor* (Adams), *Diplotoxa versicolor* (Lw.), *Ectecephala sulcata* Sabr., *Gaurax* sp., *Hippelates particeps* (Beck.), H. spp., *Oscinella frit* (L.), O. *luteiceps* Sabr., O. *soror* (Macq.), O. *umbrosa* (Lw.), O. sp., *Thaumatomyia glabra* (Meig.); *Agromyza* sp., *Cerodontha* sp., *Melanagromyza* sp., *Ophiomyia nasuta* (Mel.), O. sp.; *Mumetopia terminalis* (Lw.); *Hylenia florilega* (Zett.), H. *platyura* (Meig.), H. sp.; *Coenosia* sp., *Atherigona orientalis* Schin., *Fannia* sp., *Schoenomyza dorsalis* (Lw.); *Medina barbata* (Coq.); usual prey are Brachyecera and Cyclorrhapha, rarely Nematocera. Predator: Ants.
- Oxybelus emarginatus* Say, 1837. Boston Jour. Nat. Hist. 1: 375. ♂.  
*Oxybelus dilutus* Baker, 1896. Ent. News 7: 159. ♀.  
*Oxybelus trifidus* Cockerell and Baker, 1896. Psyche 7 (sup): 23. ♂.  
*Notoglossa americana* Robertson, 1901. Amer. Ent. soc., Trans. 27: 204. ♂, ♀.  
*Notoglossa pacifica* Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 119. ♂.  
*Notoglossa minor* Mickel, 1916. Amer. Ent. Soc., Trans. 42: 428. ♂.

**Biology:** Hartman, 1905. Tex. Univ. Bul. 65: 29-31 (prey). —Pate, 1930. Brooklyn Ent. Soc., Bul. 25: 40 (prey). —Krombein and Kurczewski, 1963. Biol. Soc. Wash., Proc. 76: 150-151 (nest, prey carriage, parasite ?). —Krombein, 1964 (1963). Brooklyn Ent. Soc., Bul. 58: 120 (prey). —Krombein, 1964. Amer. Mus. Novitates 2201: 24-26 (nest, prey transport, mating, male burrows). —Snoddy, 1968. Ent. Soc. Amer., Ann. 61: 1029-1030 (prey capture on cattle). —Peckham, Kurczewski and Peckham, 1973. Ent. Soc. Amer., Ann. 66: 655-656, figs. 12, 15 (nest, prey transport, mating, parasites).

**exclamans** Viereck. West. U. S., north to S. Dak., east to Fla., south to Mexico (Chihuahua).

**Ecology:** Makes unicellular nest in sand stored with 5 prey. Prey: *Senotainia* sp.

*Oxybelus exclamans* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 215. ♀.

*Oxybelus townsendi* Rohwer and Cockerell, 1908. Ent. News 19: 180. ♂.

*Oxybelus argentarius* Mickel, 1916. Amer. Ent. Soc., Trans. 42: 431. ♀.

*Oxybelus pectorosus* Mickel, 1918 (1917). Nebr. Univ. Studies 17: 321. ♂.

**Biology:** Kurczewski, 1972. Kans. Ent. Soc., Jour. 45: 400-402, fig. 1c (nest, prey transport).

**fossor** Rohwer and Cockerell. U. S. west of 100 degrees W., north to Nebr.; Mexico (Baja California).

*Oxybelus fossor* Rohwer and Cockerell, 1908. Ent. News 19: 179. ♀.

*Oxybelus umbrosus* Mickel, 1916. Amer. Ent. Soc., Trans. 42: 432. ♂.

*Oxybelus puente* Pate, 1943. Pan-Pacific Ent. 19: 125. ♂, ♀.

**frontalis** Robertson. U. S. east of Rocky Mts., Tex. north to Mich. and Pa.; Mexico (Veracruz).

*Oxybelus frontalis* Robertson, 1889. Amer. Ent. Soc., Trans. 16: 83. ♂, ♀.

**inornatus** (Robertson). Northeast. U. S., Mich. to Mass., south to N. C. Prey: *Pholeomyia indecora* (Lw.). Predator: *Efferia albibarbis* (Macq.).

*Notoglossa inornata* Robertson, 1901. Amer. Ent. Soc., Trans. 27: 203. ♂, ♀.

**Biology:** Krombein, 1956. Brooklyn Ent. Soc., Bul. 51: 43-44 (prey).

**krombeini** Bohart and Schlinger. Calif.

*Oxybelus krombeini* Bohart and Schlinger, 1956. Pan-Pacific Ent. 32: 149. ♂, ♀.

**laetus fulvipes** Robertson. Southeast. Coastal States north to Va.

*Oxybelus fulvipes* Robertson, 1889. Amer. Ent. Soc., Trans. 16: 82. ♂.

*Oxybelus floridanus* Robertson, 1901. Amer. Ent. Soc., Trans. 27: 203. ♂.

**laetus laetus** Say. U. S. east of 100 degrees W., Tex. to N. C., north to Mich. and Mass.

*Oxybelus laetus* Say, 1837. Boston Jour. Nat. Hist. 1: 375. ♂.

**linsleyi** Bohart and Schlinger. Calif. Prey: Therevidae sp.

*Oxybelus linsleyi* Bohart and Schlinger, 1956. Pan-Pacific Ent. 32: 151. ♂, ♀.

**Biology:** Bohart and Menke, 1976. Sphecids of world, p. 366 (prey).

**macswaini** Bohart and Schlinger. Calif., Ariz.

*Oxybelus macswaini* Bohart and Schlinger, 1956. Pan-Pacific Ent. 32: 153. ♂, ♀.

**major** Mickel. East. U. S., Tex. to N. C., north to Nebr., Mich. and Va.

*Oxybelus major* Mickel, 1916. Amer. Ent. Soc., Trans. 42: 434. ♂.

**niger** Robertson. Southeast. Canada and northeast. U. S., Minn. and Ill. to N. Y. Prey:

*Lonchaea polita* Say.

*Oxybelus niger* Robertson, 1889. Amer. Ent. Soc., Trans. 16: 82. ♂.

**Biology:** Krombein, 1958. U. S. Dept. Agr., Monog. 2, Sup. 1: 202 (prey).

**packardii** Robertson. U. S., Calif. to Fla., north to Ill., Ohio, and N. J.

*Oxybelus Packardii* Robertson, 1889. Amer. Ent. Soc., Trans. 16: 80. ♂, ♀.

*Oxybelus Packardii* var. *texanus* Robertson, 1889. Amer. Ent. Soc., Trans. 16: 81. ♂, ♀.

*Oxybelus heterolepis* Cockerell and Baker, 1896. Psyche 7 (sup.): 22. ♂.

*Oxybelus heterolepis* var. *defectus* Cockerell and Baker, 1896. Psyche 7 (sup.): 23

*Oxybelus unicus* Mickel, 1918 (1917). Nebr. Univ. Studies 17: 323. ♀.

*Oxybelus carolinus* Banks, 1921. Ent. Soc. Amer., Ann. 14: 18. ♀.

**paenemarginatus** (Viereck). Kans.

*Notoglossa paenemarginatus* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 214. ♀.

**paracochise** Bohart and Schlinger. Ariz., Tex.; north. Mexico.

*Oxybelus paracochise* Bohart and Schlinger, 1956. Biol. Soc. Wash., Proc. 69: 37. ♂, ♀.

**parvus** Cresson. U. S. west of 100° W., Nebr., and Utah to south. Calif. and north. Mexico.

*Oxybelus parvus* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 476. "♀" = ♂.

*Oxybelus intermedius* Baker, 1896. Ent. News 7: 160. ♀.

*Oxybelus coloradensis* Baker, 1896. Ent. News 7: 160. ♂.

*Notoglossa incisura* Mickel, 1916. Amer. Ent. Soc., Trans. 42: 430. ♂.

**pitanta** Pate, Calif., Nev., Ariz., N. Mex.

*Oxybelus pitanta* Pate, 1943. Pan-Pacific Ent. 19: 123. ♂.

**rancocas** Pate. N. J.

*Oxybelus rancocas* Pate, 1943. Brooklyn Ent. Soc., Bul. 38: 91. ♂.

**rejectus** Baker. Colo.

*Oxybelus rejectus* Baker, 1896. Ent. News 7: 59. ♂.

**robertsonii** Baker. Northwest. U. S., Nebr. to Oreg., south to Nev. and Calif.

*Oxybelus robertsonii* Baker, 1896. Ent. News 7: 156. ♂.

*Oxybelus varicoloratus* Baker, 1896. Ent. News 7: 157. ♀.

*Oxybelus hirsutus* Baker, 1896. Ent. News 7: 157. ♀.

*Oxybelus apicatus* Smith, 1908. Nebr. Univ. Studies 8: 409. ♂.

*Oxybelus glenensis* Smith, 1908. Nebr. Univ. Studies 8: 410. ♀.

**sericeus** Robertson. Mass. to Fla. west to S. Dak., Utah, Oreg. and Calif.; Mexico (Baja

California, Nayarit). Ecology: Makes 1-4 cells in moist sand, stores 10-20 flies per cell.

Parasite: *Senotainia litoralis* Allen. Prey: *Ephydra riparia* Fall; *Chaetopsis aenea* (Wied.), *C. fulvifrons* (Macq.).

*Oxybelus sericeus* Robertson, 1889. Amer. Ent. Soc., Trans. 16: 81. ♀.

*Oxybelus delicatus* Mickel, 1918 (1917). Nebr. Univ. Studies 17: 322. ♂.

*Oxybelus sericeus crocatus* Krombein, 1955. Brooklyn Ent. Soc., Bul. 50: 73. ♂, ♀.

Taxonomy: Evans, 1957. Amer. Ent. Soc., Trans. 83: 112, figs. 105-106 (larva).

Biology: Pate, 1930. Brooklyn Ent. Soc., Bul. 25: 41 (prey). — Krombein, 1955. Brooklyn Ent.

Soc., Bul. 50: 74 (nest, mating, prey). — Bohart and Marsh, 1960. Pan-Pacific Ent. 36:

115-118 (nest, prey carriage, mating, life cycle, parasite).

**similis** Cresson. U. S. west of Rocky Mts.

*Oxybelus similis* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 476. ♀.

*Notoglossa striatiformis* Mickel, 1916. Amer. Ent. Soc., Trans. 42: 429. ♂.

**sparideus** Cockerell. Southwest. U. S., Ariz. to Tex., Okla., south to Mexico (Veracruz).

Ecology: Nests in damp sand, makes 2-3 cells per nest, stores 3-6 prey per cell. Parasite:

Sarcophagidae spp. from maggots emerging from female prey. Prey: *Ceracia dentata*

Coq., *Chaetonodexodes* sp., *Pseudoperichaeta erecta* (Coq.), *Spathimeigenia hylotomae*

(Coq.), *Winthemia rufopicta* (Big.), *Lespesia flavifrons* Ben.; *Helicobia rapax* (Wlkr.),

*Oxysarcodexia ventricosa* (Wulp), *Ravinia derelicta* (Wlkr.), *Senotainia* sp., *Sarcophaga*

*davidsoni* Coq.; *Psilocephala haemorrhoidalis* (Macq.).

*Oxybelus sparideus* Cockerell, 1895. Amer. Ent. Soc., Trans. 22: 292. ♂.

Biology: Bohart, Lin and Holland, 1966. Ent. Soc. Amer., Ann. 59: 818-820 (nest, prey

transport, egg, life cycle, cocoon, parasitism by prey).

**subcornutus** Cockerell. U. S. from Ariz. to East Coast, N. Y. and Mich. south to Mexico

(Chihuahua). Ecology: Nests in sand, makes 1-6 cells per nest, stores 2-8 prey per cell.

Parasite: *Macronychia aurata* (Coq.), *Senotainia trilineata* (Wulp). Prey: *Allograpta*

*obliqua* (Say), *Carposcalis obscura* (Say), *Melangyna* sp., *Neocnemodon coxalis* (Curr.);

all prey were males.

*Oxybelus subcornutus* Cockerell, 1895. Amer. Ent. Soc., Trans. 22: 293. ♀.

*Oxybelus punctatus* Baker, 1896. Ent. News 7: 60. ♂.

*Oxybelus striatus* Baker, 1896. Ent. News 7: 60. ♂.

*Oxybelus cockerellii* Baker, 1896. Ent. News 7: 61. ♂.

*Oxybelus denverensis* Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 118. ♀.

Biology: Pate, 1945. Brooklyn Ent. Soc., Bul. 40: 165 (prey). — Peckham, Kurczewski and

Peckham, 1973. Ent. Soc. Amer., Ann. 66: 656-658, figs. 14, 16, 17 (nest, prey transport, parasites).

- subulatus** Robertson. Northeast. U. S., Colo. to Mass. north to Canada. Ecology: Nests in sand, makes 1-8 cells per nest, stores 3-11 prey per cell; male wasp guards nest entrance. Parasite: *Phrosinella fulvicornis* (Coq.), *P. sp.*, *Senotainia trilineata* (Wulp), *Metopia argyrocephala* (Meig.), *Macronychia sp.* Prey: *Psilocephala haemorrhoidalis* (Macq.), *P. frontalis* Cole, *Thereva candida* Lw., *Furcifera rufiventris* (Lw.); preys only upon males.
- Oxybelus mucronatus* Packard, 1867. Ent. Soc. Phila., Proc. 6: 436. ♂, ♀. Preocc.
- Oxybelus subulatus* Robertson, 1889. Amer. Ent. Soc., Trans. 16: 79. ♂, ♀.
- Oxybelus Packardi* Dalla Torre, 1890. Wien. Ent. Ztg. 9: 203. Preocc.
- Oxybelus acutus* Baker, 1896. Ent. News 7: 61. ♀.
- Oxybelus albosignatus* Smith, 1908. Nebr. Univ. Studies 8: 407. ♀.
- Oxybelus mottensis* Mickel, 1918 (1917). Nebr. Univ. Studies 17: 323. ♀.
- Biology: Peckham, Kurczewski and Peckham, 1973. Ent. Soc. Amer., Ann. 66: 652-655, figs. 8, 10, 11, 13 (male behavior, nest, prey transport, parasites).
- taenigaster** (Viereck). Cent. U. S., incl. Ariz., N. Mex., south to Mexico (Oaxaca).
- Notoglossa taenigaster* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 215. ♀.
- Oxybelus fastigatus* Mickel, 1916. Amer. Ent. Soc., Trans. 42: 433. ♂, ♀.
- Notoglossa albomaculata* Mickel, 1918 (1917). Nebr. Univ. Studies 17: 320. ♂.
- timberlakei** Bohart and Schlinger. Calif.
- Oxybelus timberlakei* Bohart and Schlinger, 1956. Pan-Pacific Ent. 32: 150. ♂, ♀.
- uniglumis** (Linnaeus). Alaska, N. W. T., South. Canada and U. S. south in Mexico to Puebla; Palaearctic, Europe to Mongolia. Ecology: Nests in sand, makes 1-5 cells per nest, transports prey on sting, stores 2-13 prey per cell. Parasite: *Senotainia rubriventris* (Macq.), *Metopia argyrocephala* (Meig.), *Phrosinella fulvicornis* (Coq.); these records are all from U. S. Prey: *Allognosta fuscitarsis* (Say); *Chrysopilus modestus* Lw., *Symphoromyia atripes* Big., *S. montana* Ald.; *Anthrax albofasciatus* Macq.; *Condylostylus patibulatus* (Say); *Metasyrphus venabiles* (Curr.); *Rivellia sp.* in melliginis group; *Anthomyia procellaris* Rond., *Emmesomyia socia* (Fall.), *Eustalomyia vittipes* (Zett.), *Hydrophoria conica* (Wied.), *H. implicata* Huck., *Hylemya depressa* Stein, *H. fugar* (Meig.), *H. lasciva* Zett., *H. platura* Meig., *H. cilicrura* (Rond.), *Pegomyia affinis* Stein; *Sapromyza monticola* Mel.; *Fannia coracina* (Lw.), *F. enatohensis* Seago, *F. pellucida* (Stein), *F. scalaris* (F.), *Helina duplicata* (Meig.), *Musca domestica* L., *Myospila mediatubunda* (F.), *Ophyra aenescens* (Wied.), *O. leucostoma* (Wied.), *Phaonia fusca* (Stein), *Spilogona sp.*; *Bufoleucilia silvarum* (Meig.), *Lucilia sp.*, *Phaenicia sericata* (Meig.), *Pollenia rudis* (F.); *Blaesoxipha hunteri* (Hough), *B. reversa* (Ald.), *Boettcheria cimbicis* (Tns.), *Helicobia rapax* (Wlkr.), *Metopia argyrocephala* (Meig.), *Oxysarcodexia cingarus* (Ald.), *Phrosinella fulvicornis* (Coq.), *Ravinia acerba* (Wlkr.), *R. lherminieri* (Desv.), *Senotainia trilineata* (Wulp); *Admontia nasoni* (Coq.), *Allophora sp.*, *Eulasiona comstocki* Tns., *Lixophaga sp.*; *Medina barbata* (Coq.), *Voria aurifrons* (Tns.); prey in U. S. consist principally of male Brachycera and Cyclorrhapha, rarely females of latter group. Predator: *Phylanthus flavifrons* Cr., *P. pulcher* D. T.
- Vespa uniglumis* Linnaeus, 1758. Syst. Nat., Ed. 10, v. 1, p. 573. ♀.
- Vespa uniglumis* (!) Christ, 1791. Naturgesch. Class. Nomencl. Ins., p. 246.
- Nomada punctata* Fabricius, 1793. Ent. Syst., v. 2, p. 346.
- Crabro tridens* Fabricius, 1798. Sup. Ent. Syst., p. 270. ♀.
- Vespa decim-maculata* Donovan, 1806. Nat. Hist. Brit. Ins., v. 11, pl. 376, fig. 1. This is a questionable synonym.
- Oxybelus pygmaeus* Olivier, 1811. Encycl. Meth., Ins., v. 8, p. 597.
- Oxybelus quadrinotatus* Say, 1824. In Keating, Narr. Long's 2nd Exped., v. 2, app., p. 338.
- Oxybelus impatiens* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 390. ♀.
- Oxybelus interruptus* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 475. ♀.
- Oxybelus fallax* Gerstaecker, 1867. Ztschr. Gesam. Naturw. Halle 30: 91. ♀.
- Oxybelus Brodiei* Provancher, 1883. Nat. Canad. 14: 36. ♀.
- Oxybelus quadrinotatus* var. *montanus* Robertson, 1889. Amer. Ent. Soc., Trans. 16: 78. ♂, ♀.
- Oxybelus hispanicus* Giner, 1943. Inst. Espan. Ent., Trab., Fam. Sphecidae, p. 260. ♂, ♀.

Biology: Peckham and Peckham, 1898. Wis. Geol. and Nat. Hist. Survey, Bul. 2: 73-76 (nest, prey transport). — Parker, 1915. Ent. Soc. Wash., Proc. 17: 74-75 (nest, prey transport, parasites). — Pate, 1930. Brooklyn Ent. Soc., Bul. 25: 41 (prey). — Williams, 1936. Pan-Pacific Ent. 12: 1-3, fig. 1 (nest, prey transport, predator). — Krombein, 1936. Ent. News 47: 95 (prey transport). — Strandtmann, 1945. Ent. Soc. Amer., Ann. 38: 313 (nest, prey transport, parasite). — Krombein, 1948. Ent. Soc. Wash., Proc. 50: 67 (prey). — Krombein, 1956. Brooklyn Ent. Soc., Bul. 51: 44 (prey transport). — Evans, 1970. Mus. Compar. Zool., Bul. 140: 493 (nest, prey transport, parasites, predator). — Peckham, Kurczewski and Peckham, 1973. Ent. Soc. Amer., Ann. 66: 651-652, figs. 2, 9 (nest, prey transport, parasites).

**ventralis** Fox. Pacific Coast, Wash., south to Mexico (Baja California).

*Oxybelus ventralis* Fox, 1894. Calif. Acad. Sci., Proc. (2) 4: 107. ♀.

*Oxybelus manni* Rohwer, 1909. Amer. Ent. Soc., Trans. 35: 117. ♀.

**xerophilus** Bohart and Schlinger. Calif., Ariz.

*Oxybelus xerophilum* Bohart and Schlinger, 1956. Pan-Pacific Ent. 32: 154. ♂.

#### SUBFAMILY CRABRONINAE

This large subfamily includes species which nest in the ground, in pre-existing cavities in wood, twigs, stems, and in the soft pith of various plants or shrubs.

Revision: Fox, 1895. Amer. Ent. Soc., Trans. 22: 129-226 (N. Amer. spp.).

Taxonomy: Pate, 1944. Amer. Midland Nat. 31: 329-384 (gen. of world). — Leclercq, 1954.

Monog. Hym. Crabron., 371 pp., 40 figs., 84 maps (phylogeny, zoogeography, key to world gen., catalog of world spp.).

#### Genus ANACRABRO Packard

*Anacrabro* Packard, 1866. Ent. Soc. Phila., Proc. 6: 67.

Type-species: *Anacrabro ocellatus* Packard. Monotypic.

**ocellatus boerhaviae** Cockerell. N. Mex., Ariz.; Mexico (Chihuahua, Sonora, Sinaloa, Durango, Colima ?).

*Anacrabro boerhaviae* Cockerell, 1895. Canad. Ent. 27: 308. ♂.

**ocellatus ocellatus** Packard. S. Canada and U. S. east of Rockies, except Fla. Ecology: Nests in sand, makes 1-9 or more cells per nest, stores 4-7 prey per cell. Parasite: *Miltogrammini* sp.?, Diptera sp. Prey: *Lygus oblineatus* (Say), *L. lineolaris* (Beauv.), *Plagiognathus politus* Uhl.; only adults are stored. Predator: *Acanthomyops claviger* (Rog.), *Monomorium* sp.

*Anacrabro ocellatus* Packard, 1866. Ent. Soc. Phila., Proc. 6: 68. ♀.

*Thyreopis rugoso-punctatus* Provancher, 1883. Faune Ent. Canada, Hym., p. 664. ♀. A secondary homonym in *Crabro*.

*Crabro rugulosopunctatus* Dalla Torre, 1897. Cat. Hym., v. 8, p. 624. N. name.

Taxonomy: Evans, 1957. Amer. Ent. Soc., Trans. 83: 102, figs. 75-84 (larva).

Biology: Barth, 1909 (1908). Wis. Nat. Hist. Soc., Bul. 6: 147-153, 10 figs. (nest, prey, parasite, predator). — Kurczewski and Peckham, 1970. Ent. Soc. Amer., Ann. 63: 1419-1424, 7 figs. (nest, prey transport, egg, parasite, predator).

**ocellatus robertsoni** Rohwer. Fla.

*Anacrabro robertsoni* Rohwer, 1920. Ent. Soc. Wash., Proc. 22: 58. ♀.

Taxonomy: Krombein, 1948. Brooklyn Ent. Soc., Bul. 43: 20-21 (status of N. Amer. spp.).

— Leclercq, 1973. Acta Zool. Lilloana 30: 38-41 (key to New World spp., and revision of Neotropical spp.).

#### Genus ENCOPOGNATHUS Ashmead

The name *Encopognathus* was first employed by Kohl, 1896 (K. K. Naturhist. Hofmus., Ann. 11: 485, 486). However, it may not be validated from that date, for Kohl proposed it as a name for a species group ("Artengruppe") of the subgenus *Lindenius*. The earliest use of the name in

a generic or subgeneric sense was by Ashmead, 1899, who characterized it as a genus.

The species nest in soil, and African forms have been reported to provision their nests with ants. One species in North America and two species in Sri Lanka have been observed recently preying upon Miridae, both nymphs and adults.

Revision: Pate, 1943. Lloydia 6: 53-76, 15 figs. (key to subg. and revision of N. Amer. spp.).

#### Genus ENCOPOGNATHUS Subgenus ENCOPOGNATHUS Ashmead

*Encopognathus* Ashmead, 1899. Canad. Ent. 31: 166.

Type-species: *Crabro* (*Encopognathus*) *Braueri* Kohl. Orig. desig.

The typical subgenus does not occur in North America.

#### Genus ENCOPOGNATHUS Subgenus RHECTOGNATHUS Pate

*Encopognathus* subg. *Rhectognathus* Pate, 1936. Ent. News 47: 147.

Type-species: *Encopognathus* (*Rhectognathus*) *pectinatus* Pate. Orig. desig.

*pectinatus* Pate. Calif.

*Encopognathus* (*Rhectognathus*) *pectinatus* Pate, 1936. Ent. News 47: 148. ♀, ♂.

*rufiventris* Timberlake. Calif. (San Bernardino Co.).

*Encopognathus* (*Rhectognathus*) *rufiventris* Timberlake, 1940. Ent. News 51: 167. ♀.

#### Genus ENCOPOGNATHUS Subgenus TSAISUMA Pate

*Encopognathus* subg. *Tsaishuma* Pate, 1943. Lloydia 6: 57.

Type-species: *Lindenius wenonah* Banks. Orig. desig.

*wenonah* (Banks). Calif., Oreg.

*Lindenius wenonah* Banks, 1921. Ent. Soc. Amer., Ann. 14: 16. ♂.

#### Genus ENTOMOGNATHUS Dahlbom

These wasps nest in the ground and prey upon adult chrysomelid beetles.

Biology: Miller and Kurczewski, 1972. Psyche 79: 61-69, 72-75 (nesting behavior).

#### Genus ENTOMOGNATHUS Subgenus ENTOMOGNATHUS Dahlbom

*Entomognathus* Dahlbom, 1844. Hym. Europaea, v. 1, p. 295.

Type-species: *Crabro brevis* Vander Linden. Monotypic.

The typical subgenus does not occur in North America.

#### Genus ENTOMOGNATHUS Subgenus TONCAHUA Pate

*Entomognathus* subg. *Toncahua* Pate, 1944. Amer. Midland Nat. 31: 341.

Type-species: *Entomognathus texanus* Cresson. Orig. desig.

*Encopognathus* subg. *Florkinus* Leclercq, 1956. Inst. Roy. Sci. Nat. Belg., 32 (20): 2.

Type-species: *Encopognathus* (*Florkinus*) *evolutionis* Leclercq. Orig. desig.

Taxonomy: Krombein, 1963. Biol. Soc. Wash., Proc. 76: 247-254 (spp. of eastern U. S.).

*arenivagus* Krombein. Fla. (Arcadia), N. C. (?). Ecology: Nests in sand.

*Entomognathus* (*Toncahua*) *arenivaga* Krombein, 1963. Biol. Soc. Wash., Proc. 76: 249. ♂, ♀.

*lenapeorum* Viereck. N. J. to Va., Kans. Ecology: Nests in open wooded areas.

*Entomognathus lenapeorum* Viereck, 1904. Amer. Ent. Soc., Trans. 30: 239. ♀.

*memorialis* Banks. Conn. to Va., Kans. Ecology: Nests in sandy-loam cliffs, occasionally in pre-existing burrows, makes 9-20 cells per nest which may be arranged singly, in fan-shaped clusters, or in tandem; stores 3-9 prey per cell. Prey: *Altica ulmi* Woods, *A. marevagens* Horn; adults.

*Entomognathus memorialis* Banks, 1921. Ent. Soc. Amer., Ann. 14: 16. ♀.

Taxonomy: Miller and Kurczewski, 1972. Psyche 79: 69-72, figs. 5-12 (larva).

Biology: Miller and Kurczewski, 1972. *Psyche* 79: 64-69, figs. 1-4 (mating, nest, prey transport, egg, cocoon).

*texasus* Cresson. Pa., Kans. to Tex., N. Mex.; Mexico (Tamaulipas). Prey: *Diabrotica tricincta* Say adult.

*Entomognathus texanus* Cresson, 1887. *Amer. Ent. Soc., Trans., Sup. Vol.*, p. 286. ♀, ♂.

*Anothyreus panurgoides* Viereck, 1904. *Amer. Ent. Soc., Trans.* 30: 239. ♂ (♀ misdet.).

Biology: Cazier and Mortenson, 1965. *Pan-Pacific Ent.* 41: 33 (prey).

### Genus LINDENIUS Lepeletier and Brulle

*Lindenius* Lepeletier and Brulle, 1834. *Soc. Ent. France, Ann.* 3: 791.

Type-species: *Crabro albilabris* Fabricius. Desig. by Westwood, 1839.

*Lindenius* subg. *Chalcolamprus* Wesmael, 1852. *Acad. Roy. Sci. Belg., Bul.* 19: 590.

Type-species: *Crabro albilabris* of Vander Linden. Monotypic.

*Crabro* subg. *Trachelosimus* Morawitz, 1866. *Acad. Imp. Sci. St. Petersburg, Bul.* 9: 249.

Type-species: *Crabro armatus* Vander Linden. Monotypic.

These small wasps nest in firmly packed sand or fine gravel, frequently in large aggregations, and construct a vertical main burrow which usually leads to a short horizontal passage. The prey consists of small adult Hymenoptera and Diptera, and both nymphal and adult Hemiptera; specific differences as to the kinds of prey stored are found among the six species studied.

Taxonomy: Pate, 1947. *Notulae Nat.* 185: 4-7 (key to subg. and syn. of N. Amer. spp.).

Biology: Miller and Kurczewski, 1974 (1973). *Ins. Sociaux* 20: 365-378, 1 fig. (male-female interactions in aggregations of several spp.). — Miller and Kurczewski, 1975. *N. Y. Ent. Soc., Jour.* 83: 82-120, 12 figs. (comparative behavior of several Nearctic and Palaearctic spp.).

*armaticeps* (Fox). South. Canada, U. S. northeast from Colo. and Tex. Ecology: Nests in sand cliffs or in flat hard-packed sand, makes 3-11 cells per nest, stores 3-15 prey per cell.

Parasite: *Phrosinella fulvicornis* (Coq.), *Senotainia* sp. ? Prey: *Diplotaxa versicolor* (Lw.), *Meromyza* sp. near *pratorum* Meig., *Paratecephala eucera* (Lw.), *P. sanguinolenta* (Lw.), *Thaumatomyia glabra* (Meig.), *T. sp.*, *Chlorops* sp.; all prey records are of Chloropidae.

*Crabro armaticeps* Fox, 1895. *Amer. Ent. Soc., Trans.* 22: 185. ♂.

*Crabro flaviclypeus* Fox, 1895. *Amer. Ent. Soc., Trans.* 22: 186. ♀.

*Crabro (Lindenius) zellus* Rohwer, 1909. *Ent. News* 20: 151. ♀.

Biology: Kurczewski, 1972. *Kans. Ent. Soc., Jour.* 45: 399 (prey). — Miller and Kurczewski, 1974 (1973). *Ins. Sociaux* 20: 368, 372-378 (male-female intraspecific interaction, nest, parasites). — Miller and Kurczewski, 1975. *N. Y. Ent. Soc., Jour.* 83: 90-96, figs. 1-5 (nest, prey capture and transport, egg, cocoon, life cycle, parasite).

*buccadentis* Mickel. U. S. east from Wyo., north from Ark. Ecology: Nests in bare, level hard-packed roadbeds of coarse sand, makes up to 4 cells per completed nest, stores 22-77 prey per cell. Prey: *Drapetis* sp. near *divergens* Lw.; *Agathis* spp., *Apanteles paralechia* Mues., *A. sp.*, *Bracon* sp., *Diaeretus* sp., *Orgilus* sp., *Pauesia* sp., *Phanerotoma* sp., *Rhaconotus cressoni* Mues. and Walkl.; *Acrolytina* sp., *Mesochorus* sp., *Toxophoroides scitulus* (Cr.); *Achrysocharella silvia* Gir., *Chrysocharis* sp., *Closterocerus tricinatus* (Ashm.), *Euderus* sp., *Eulophus anomocerus* (Cwfd.), *Euplectrus* sp., *Hyssopus* sp., *Tetrastichus whitmani* (Gir.), *T. spp.*; *Perilampus fulvicornis* Ashm., *P. robertsoni* Cwfd.; *Ormyrus brunneipes* Prov.; *Capellia* sp., *Erythromalus* sp., *Gastrancistrus aphidis* (Gir.), *Pachyneuron siphonophorae* (Ashm.), *Pteromalinae* sp.; *Bruchophagus* sp., *Eudecatoma* sp.; *Spilochalcis* sp.; *Charips* spp., *Cynipinae* sp.; *Apenesia parapolita* Evans, *Goniozus* sp.; *Monomorium minimum* (Buckl.), *Tapinoma sessile* (Say); preferred prey were species of Ichneumonidae and Chalcidoidea, and only one dipteran was stored.

*Lindenius buccadentis* Mickel, 1916. *Amer. Ent. Soc. Trans.* 42: 427. ♀, ♂.

Biology: Miller and Kurczewski, 1974 (1973). *Ins. Sociaux* 20: 368, 372-378 (male-female intraspecific interaction). — Miller and Kurczewski, 1975. *N. Y. Ent. Soc., Jour.* 83: 96-101, fig. 6 (nest, prey transport, egg, cocoon).



**californicus** Court and Bohart. Calif.

*Lindenius californicus* Court and Bohart, 1958. Pan-Pacific Ent. 34: 161, figs. 1, 8, 11. ♂, ♀.

**columbianus** (Kohl). South. Canada, U. S. Ecology: Nests in dense aggregations in firmly

packed clay-sand, occasionally in pre-existing burrows and in sand cliffs, may make up to 10 cells per nest, stores 8-76 prey per cell. Parasite: *Phrosinella fulvicornis* (Coq.), *Senotainia* sp. ?; *Phalacrotophora halictorum* Mel. and Brues ?; *Myrmosa unicolor* Say? Prey: *Dasyhelea grisea* (Coq.), *D.* spp., *Forcipomyia brevipennis* (Macq.), *Jenkinshelea magnipennis* (Joh.), *Chironomus* spp., *Cricotopus* sp., *Orthocladus* spp., *Paratendipes subaequalis* (Mall.), *Pentaneura* sp., *Procladius* spp., *Psectrocladius* sp., *Tanytarsus* sp.; *Bradysia* sp.; *Swammerdamella obtusa* Cook, *S. sagittata* Cook, *Scatopys fuscipes* Meig.; *Anarete johnsoni* (Felt), *A. pritchardi* Kim, *A.* spp., *Asteromyia carbonifera* (O. S.), *Climodiplosis* sp., *Dasineura* sp., *Mayetiola* sp., *Neolasioptera* spp., *Ozirkincus millefolii* (Wachtl), *Porricondyla* sp., *Procystiphora* sp.; *Drapetis septentrionalis* Mel., *D.* sp., *Platypalpus trivialis* Lw., *P.* sp., *Rhamphomyia* sp.; *Chamaemyia fulvicornis* (Fall.), *Lencopis* sp.; *Madiza parva* (Adams), *Leptomeltopa halteralis* (Coq.), *L. latipes* (Meig.), *Paramyia nitens* (Lw.); *Philygria debilis* Lw., *Hydrellia* sp.; *Contioscinella melancholica* (Beck.), *C. minor* (Adams), *C. triorbiculata* (Sabr.), *Diptoloxa versicolor* (Lw.), *Hippelates bishoppi* Sabr., *H.* sp. near *bishoppi* Sabr., *Meromyza* sp., *Olella cinerea* (Lw.), *O. parva* (Adams), *O. quadrivittata* Sabr., *O. trigramma* (Lw.), *Oscinella carbonaria* (Lw.), *O. frit* (L.), *O. luteiceps* Sabr., *O. soror* (Macq.), *O. umbrosa* (Lw.), *O.* sp., *Siphonella nigripalpis* (Mall.); *Agromyza* sp., *Cerodontha dorsalis* (Lw.), *C.* sp., *Liriomyza* sp., *Ophiomyia* sp., *Phytoliriomyza arctica* (Lundb.), *Pseudonapomyza lacteipennis* (Mall.); *Diptera* spp.; *Orius insidiosus* (Say), *O. tristicolor* (White); *Chlamydatus associatus* (Uhl.), *Miridae* spp.; *Lygaeidae* sp.; *Aphis* sp., *Capitophorus elaeagni* (Del Guer.), *Rhopalosiphum maidis* (Fitch), *Schizaphis* sp.; *Hemiptera* spp.; *Agathis* spp., *Apanteles limentidis* Riley, *A. xylinus* (Say), *A.* spp., *Aphidius obscuripes* Ashm., *A.* spp., *Bracon* sp., *Chelonus* sp., *Dacnusa* sp., *Diaeretiella* spp., *Elasmosoma* sp., *Euphorina uniformis* Gah., *Lysaphidus* sp., *Lysiphlebus* sp., *Microplitis* sp., *Orgilus gelechia* (Ashm.), *O.* sp., *Praon* spp., *Trioxys* spp.; *Adelognathus flavopictus* Davis; *Polynema* sp.; *Aprostocetus* sp., *Chrysocharis* sp., *Diaulnopsis callichroma* Cwfd., *Euderus subopacus* (Gah.), *Euderus* sp., *Hemiptarsenus americanus* (Gir.), *Hyssopus novus* Gir., *Necremnus* sp., *Notanisomorpha ainsliei* Cwfd., *Pnigilio* sp., *Sympiesis bimaculatipennis* (Gir.), *Tetrastichus bruchophagi* Gah., *T. chlamytis* Ashm., *T. fumipennis* (Gir.), *T. incertus* (Ratz.), *T. semilongifasciatus* (Gir.), *T. tesserus* Burks, *T.* spp., *Entedontini* sp.; *Copidosoma* sp., *Anagyrini* sp., *Bothriothoracini* sp.; *Eupelmella vesicularis* (Retz.), *Eupelmus allynii* (French), *E.* sp.; *Pseudometageta schwarzi* (Ashm.), *Eucharitidae* sp.; *Eiridontomerus isosomatis* (Riley), *Pseudotorymus lazulellus* (Ashm.); *Asaphes lucens* (Prov.), *Ecrizotes* sp., *Erizestus winnemanna* Cwfd., *Habroclytus* sp., *Halticoptera patellanna* (Dalm.), *H.* sp., *Heteroschema* sp., *Homoporus chalcidiphagus* (Walsh and Riley), *H. febriculosus* (Gir.), *Mesopolobus* sp., *Pachyneuron allograptae* Ashm., *P. siphonophorae* (Ashm.), *P.* sp., *Paracrizotes marylandensis* Gir., *Pteromalus puparum* (L.), *P. vanessae* Harr., *Systasis* sp., *Tridymus* sp., *Pirene* sp., *Pteromalini* sp., *Tridymini* sp.; *Bruchophagus* sp., *Eudecatoma* sp., *Eurytoma* sp., *Harmolita* sp., *Systole* sp., *Spilochalcis albifrons* (Walsh); *Chalcidoidea* sp.; *Lygocerus* sp.; *Lasius* sp.; *Spilomena pusilla* (Say); prey preferences vary at different localities depending upon ecological factors; Chironomidae are preferred prey in nesting sites near water; in other areas Pteromalidae, Scatopsidae, Chloropidae, Eulophidae, Ceratopogonidae, Milichiidae, Cecidomyiidae, Eucharitidae and Anthocoridae are important as prey. Predator: *Philanthus pulcher* D. T., *P. pacificus* Cr.

*Crabro* (*Lindenius*) *columbianus* Kohl, 1892. K. K. Naturhist. Hofmus., Ann. 7: 203. ♀.

*Crabro errans* Fox, 1895. Amer. Ent. Soc., Trans. 22: 184. ♀, ♂.

*Crabro pinguis* Fox, 1895. Amer. Ent. Soc., Trans. 22: 186. ♀.

*Ammoplanus salicis* Cockerell, 1897. Ann. and Mag. Nat. Hist. (6) 19: 402. ♀.

Biology: Evans, 1970. Mus. Compar. Zool. 140: 491 (nest, prey, predators). — Miller and Kurczewski, 1974 (1973). Ins. Sociata 20: 368-378, 1 fig. (male-female intraspecific interactions, nest, prey, parasites ?). — Miller and Kurczewski, 1975. N. Y. Ent. Soc., Jour.

- 83: 101-115, figs. 7-15 (nest, prey capture and transport, egg, cocoon, life cycle). —Bohart and Menke, 1976. Sphecids wasps of world, p. 383 (nest, prey capture and transport).
- inyoensis* Court and Bohart. Calif., Nev.  
*Lindenius inyoensis* Court and Bohart, 1958. Pan-Pacific Ent. 34: 164, figs. 3, 5, 14. ♀, ♂.
- latifrons* (Fox). Tex.  
*Crabro latifrons* Fox, 1895. Amer. Ent. Soc., Trans. 22: 185. ♀.
- montezuma* (Cameron). South. Calif. to west. Tex.; Mexico (Guanajuato, Guerrero).  
*Crabro montezuma* Cameron, 1891. Biol. Cent.-Amer., Hym., v. 2, p. 151, pl. 9, fig. 13, 13a. ♀, ♂.  
*Lindenius (Trachelosimus) dugesianus* Leclercq, 1950. Inst. Roy. Sci. Nat. Belg., Bul. 26, no. 6, p. 1. ♀.
- neomexicanus* Court and Bohart. N. Mex., Colo.  
*Lindenius neomexicanus* Court and Bohart, 1958. Pan-Pacific Ent. 34: 166, figs. 2, 4, 6, 13. ♀, ♂.
- tecuya* Pate. Calif. Ecology: Nests in mixed sand-gravel at edge of river. Prey: Diptera spp., 6 families; Chalcidoidea spp., 3 families; Anthocoridae sp.  
*Lindenius (Trachelosimus) tecuya* Pate, 1947. Notulae Nat. 185: 5. ♀, ♂.
- Biology: Bohart and Menke, 1976. Sphecids wasps of world, pp. 383-384 (nest, prey).
- tylotis* Court and Bohart. Calif. Ecology: Nests in silty soil at creek edge, makes 4-24 cells per nest, and stores an average of 8 prey per cell. Parasite: *Myrmica bradleyi* Rob. Prey: Diptera spp.; Hemiptera spp.; Hymenoptera spp.  
*Lindenius tylotis* Court and Bohart, 1958. Pan-Pacific Ent. 34: 164, figs. 9, 10, 12. ♂, ♀.
- Taxonomy: Evans, 1959. Amer. Ent. Soc., Trans. 85: 162-163, figs. 51-53 (larva).
- Biology: Bohart and Menke, 1976. Sphecids wasps of world, p. 383 (nest, prey, parasite).

#### Genus RHOPALUM Stephens

The North American species, and most of the extralimital taxa, nest in the pith of twigs, in hollow stems or reeds, in rotten wood, and in abandoned beetle borings in wood. One extralimital species is known to nest in the ground. Prey of the species occurring in North America includes small Diptera and Psocoptera. Some extralimital taxa prey upon Aphididae, Psyllidae, winged Formicidae and Microlepidoptera.

Taxonomy: Bohart, 1974. Ga. Ent. Soc., Jour. 9: 252-260, 33 figs. (review of N. Amer. spp.).

#### Genus RHOPALUM Subgenus RHOPALUM Stephens

*Euplilis* Risso, 1826. Hist. Nat. Europ. Merid., v. 5, p. 227.

Type-species: *Crabro rufiventris* Panzer. Desig. by Pate, 1935.

*Rhopalum* Stephens, 1829. Nomencl. Brit. Ins., p. 34.

Type-species: *Crabro rufiventris* Panzer. Desig. by Curtis, 1837.

*Physoscelus* Lepeletier and Brulle, 1835. Soc. Ent. France, Ann. 3: 804.

Type-species: *Crabro rufiventris* Panzer. Desig. by Westwood, 1839.

*Physoscelus* Westwood, 1837. Introd. Mod. Classif. Ins. 2, Gen. Synop., p. 80. Lapsus or emend.

Taxonomy: Menke, Bohart and Richards, 1974. Bul. Zool. Nomencl. 30: 219-220 (petition to suppress *Euplilis* Risso, 1826, and place *Rhopalum* Stephens, 1829, on Official List of Generic Names). —Day *et al.*, 1975. Bul. Zool. Nomencl. 32: 96-99 (comments on petition by Menke *et al.*). —Krombein, 1976. Bul. Zool. Nomencl. 32: 205-207 (comment on petition by Menke *et al.*).

*atlanticum* Bohart. Ga. (Athens, Atlanta), N. Y. (Long Island). Ecology: Nests in abandoned borings of *Ceratina* sp. in dead *Erianthus* sp. (plume grass), stores 31-41 adult or nymphal Psocoptera per cell. Parasite: *Eurytoma inornata* Bugbee. Prey: *Caecilius pinicola* Bks.; *Peripocus madidus* Hagen, *P. quadrifasciatus* Harr.; *Lachesilla forcepeta* Chapm., L. sp.; *Psocidus pollutus* Walsh, *Trichadenotecnum circuliroides* Bed.

*Rhopalum atlanticum* Bohart, 1974. Ga. Ent. Soc., Jour. 9: 256, figs. 26-33. ♂, ♀.

**clavipes clavipes** (Linnaeus). Maine, N. H., R. I., Md., Idaho, Wash., Oreg., Calif.; cent. and south Europe. Ecology: In Europe nests in straws, stores 16-26 psocid prey per cell. Prey: In Europe *Graphopsocus cruciatus* (L.), *Peripsocus phaeopterus* (Ste.), *Ellipsocus westwoodi* McLack., *Mesopsocus immunis* (Ste.), *Loenisia variegata* (Latr.), *Hyperates questfalicus* Kolb.; mostly adult females, a few nymphs, one adult male. Another subsp. occurs in Japan.

*Sphex clavipes* Linnaeus, 1758. Syst. Nat., ed. 10, p. 569.

*Crabro rufiventris* Panzer, 1799. Faunae Ins. German., heft 72, fig. 12.

Taxonomy: Marechal, 1929. Soc. Ent. France, Ann. 98: 115-116 (larva).

Biology: Freeman, 1938. Roy. Ent. Soc. London, Proc., Ser. A, 13: 1-2 (nest, prey, cocoon, life cycle in England).

#### Genus RHOPALUM Subgenus CORYNOPUS Lepeletier and Brulle

*Corynopus* Lepeletier and Brulle, 1834. Soc. Ent. France, Ann. 3: 802.

Type-species: *Crabro tibialis* Panzer. Monotypic.

*Dryphus* Herrich-Schaeffer, 1840. Nomencl. Ent., heft. 2, p. 123.

Type-species: *Crabro tibialis* Fabricius. Monotypic.

*Alliognathus* Ashmead, 1899. Canad. Ent. 31: 219.

Type-species: *Crabro occidentalis* Fox. Orig. desig.

Taxonomy: Pate, 1947. Notulae Nat. 185: 7-10 (synonymic notes on N. Amer. spp.).

**coarctatum** (Scopoli). Canada and U. S. in Transit. and U. Austr. Zones east of Rocky Mts.;

Europe, Siberia. Ecology: Nests in soft pith of dead hibiscus stems and in borings in wood, makes up to 12 cells per nest, stores as many as 20 prey per cell. Parasite:

*Tetrabaes americanus* (Brues); *Eurytoma inornata* Bugb.; *Melittobia chalybii* Ashm.;

*Megaselia* sp.? Prey: *Palpomyia subasper* (Coq.); *Chironomus fulvus* Joh., *C. viridulus* (L.), *C. nervosus* Staeg., Chironomidae sp.?

*Sphex coarctata* Scopoli, 1763. Ent. Carn., p. 293, pl. 42, fig. 778. ♂.

*Crabro crassipes* Fabricius, 1798. Sup. Ent. System., p. 270.

*Crabro tibialis* Fabricius, 1798. Sup. Ent. System., p. 271. Preoce.

*Rhopalum modestum* Rohwer, 1908. Ent. News 19: 257. ♂.

Taxonomy: Evans, 1964. Amer. Ent. Soc., Trans. 90: 292-293, figs. 111-112 (larva).

Biology: Krombein, 1964. Biol. Soc. Wash., Proc. 77: 90-92 (nest, prey, life cycle, cocoon, parasites). — Krombein, 1967. Trap-nesting wasps and bees, pp. 259-260 (nest, prey, life cycle, parasites).

**occidentale** (Fox). Maine, Conn., N. Y., N. C., Mich., Colo., Wyo., Nev., Calif., Oreg., B. C.

*Crabro occidentalis* Fox, 1895. Amer. Ent. Soc., Trans. 22: 200. ♀.

*Rhopalum (Alliognathus) carolina* Banks, 1921. Ent. Soc. Amer., Ann. 14: 17. ♀.

**pacificum** Bohart. Nev., Calif., Oreg. Ecology: Nests in *Sambucus* stems. Parasite:

*Diormorus zabriskiei* Cr.

*Rhopalum pacificum* Bohart, 1974. Ga. Ent. Soc., Jour. 9: 258, figs. 6-14. ♂, ♀.

Biology: Parker and Bohart, 1966. Pan-Pacific Ent. 42: 94 (nest, parasite; misdet. as *arapaho* Pate).

**pedicellatum** Packard. Maine, Mass., Conn., N. Y., Md., Wis., Minn., Colo. Ecology: Nests in pre-existing cavities in old stump and in raspberry stalks, stores 25-33 prey per cell.

Prey: *Chironomus* sp.

*Rhopalum pedicellatum* Packard, 1867. Ent. Soc. Phila., Proc. 6: 380. ♀, ♂.

*Rhopalum rubrocinctum* Peckham and Peckham, 1898. Wis. Geol. Nat. Hist. Survey, Bul. 2: 43. ♀.

*Euphilis (Corynopus) arapaho* Pate, 1947. Notulae Nat. 185: 8. ♀, ♂.

Taxonomy: Evans, 1957. Amer. Ent. Soc., Trans. 83: 104-105, figs. 99-104 (larva).

Biology: Packard, 1869. Guide Study Ins., p. 158 (nest). — Peckham and Peckham, 1895. Wis. Geol. Nat. Hist. Survey, Bul. 2: 42-43 (nest, prey).

**rufigaster** Packard. U. S. e. of 100th meridian. Ecology: Nests in pith of green and dead *Hibiscus* stems and in old anobiid borings in wood, makes 3-27 cells per nest, stores 29-50 prey per cell. Parasite: *Tetrabaesus americanus* (Brues); *Eurytoma inornata* Bugb.; *Diomorus zabriskiei* Cr.; *Ptychoneura aristalis* (Coq.). Prey: *Chironomus fulvus* Joh., *C. modestus* Say, *C. neomodestus* Mall., *C. nervosus* Staeg., *C. nigrovittatus* Mall., *C. xenolabis* (K.), *Cricotopus* spp., *Calopsectra* sp., *Procladius culiciformis* (L.), *Tanytarsus* sp., Orthocladinae sp., Chironomidae spp.; *Polymeda cana* (Wlkr.); *Bezzia setulosa* (Lw.).

*Rhopalum rufigaster* Packard, 1867. Ent. Soc. Phila., Proc. 6: 382. ♀, ♂.

*Rhopalum lucidum* Rohwer, 1909. Ent. News 20: 324. ♀.

Taxonomy: Evans, 1964. Amer. Ent. Soc., Trans. 90: 291-292, fig. 110 (larva).

Biology: Krombein, 1958. Biol. Soc. Wash., Proc. 71: 26 (nest, prey transport). —Krombein, 1964. Biol. Soc. Wash., Proc. 77: 92-98, figs. 12-14 (nest, prey, life cycle, cocoon, parasites).

### Genus MONIAECERA Ashmead

*Moniaecera* Ashmead, 1899. Canad. Ent. 31: 220.

Type-species: *Crabro abdominalis* Fox. Orig. desig.

The described species are all recorded from America north of Mexico, but there are some undescribed taxa in Mexico. These wasps nest in the soil and prey upon a variety of insect groups including leafhoppers, psyllids, mirids and chironomids.

Revision: Pate, 1948. Amer. Ent. Soc., Trans. 74: 41-60, 6 figs., 1 map.

**abdominalis** (Fox). Ga., Tex., Kans., Ariz. Ecology: Nests in sand. Prey: *Tylozygus bifidus* (Say).

*Crabro abdominalis* Fox, 1895. Amer. Ent. Soc., Trans. 22: 198. ♀.

Biology: Hartman, 1905. Tex. Acad. Sci., Trans. 7: 57-58 (nest, prey).

**asperata** (Fox). Tex., N. Mex., Ariz., Calif. Ecology: Nests in powdery clay-sand or hard packed soil, 2-3 females sharing same burrow entrance but presumably making individual cells stored with about 20 prey each. Prey: *Procladius* sp. near *bellus* (Lw.); *Heteropsyllus texana* Cwfd., *Aphalaroida* spp., *Paratrioza* sp.; *Circulifer tenellus* (Bak.), *Empoasca abrupta* DeLong, *Erythroneura* sp., Typhlocybinae sp.; Miridae sp.; all prey were adults.

*Crabro asperatus* Fox, 1895. Amer. Ent. Soc., Trans. 22: 199. ♂.

Taxonomy: Evans, 1964. Amer. Ent. Soc., Trans. 90: 293-294, figs. 74-77 (larva).

Biology: Evans, 1964. Ins. Sociaux 11: 71-78, 3 figs. (communal nesting, prey transport).

—Cazier and Mortenson, 1964. Pan-Pacific Ent. 40: 111-114, 1 fig. (nest, prey).

**evansi** Pate. Ariz. (Tucson).

*Moniaecera evansi* Pate, 1947. Ent. News 57: 239. ♂.

**foxiana** Pate. Calif.

*Moniaecera* (*Moniaecera*) *foxiana* Pate, 1948. Amer. Ent. Soc., Trans. 74: 49. ♀, ♂.

**pinal** Pate. Ariz., Calif.

*Moniaecera pinal* Pate, 1947. Notulae Nat. 185: 10. ♂.

### Genus HUAVEA Pate

*Moniaecera* subg. *Huavea* Pate, 1948. Amer. Ent. Soc., Trans. 74: 58.

Type-species: *Moniaecera* (*Huavea*) *chontale* Pate. Orig. desig.

The morphological features of the female suggest that members of this genus nest in the ground.

**pima** Court and Bohart. Ariz. (Santa Cruz and Pima Co's.).

*Huavea pima* Court and Bohart, 1966. Pan-Pacific Ent. 42: 331, figs. 1, 2. ♂, ♀.

## Genus CROSSOCERUS Lepeletier and Brulle

This large genus contains a number of subgenera and numerous species. Some of the subgenera are ground-nesters, others nest in pre-existing burrows or cavities in wood, or construct their own burrows in soft pith of herbs and stems or in rotten wood. Most species prey upon small Diptera, but some prey upon Homoptera, Trichoptera, Microlepidoptera, Hemiptera, and, rarely, Mecoptera and Ephemeroptera. So far as known, our North American species do not store this entire range of prey.

Taxonomy: Pate, 1944 (1943). Lloydia 6: 267-271 (key to subg.). —Leclercq, 1968. Soc. Roy. Sci. Liege, Bul. 27: 99-100 (key to xylicolous subg.).

## Genus CROSSOCERUS Subgenus CROSSOCERUS Lepeletier and Brulle

*Crossocerus* Lepeletier and Brulle, 1834. Soc. Ent. France, Ann. 3: 763.

Type-species: *Crabro scutatus* Fabricius. Desig. by Westwood, 1839.

*Crabro* subg. *Microcrabro* Saussure, 1892. In Grandidier, Hist. Nat. Madagascar 20: 574. N. syn. (R. C. Miller).

Type-species: *Crabro (Microcrabro) micromegas* Saussure. Monotypic.

*Stenocrabro* Ashmead, 1899. Canad. Ent. 31: 216.

Type-species: *Crabro planipes* Fox. Orig. desig.

*Synorhopalum* Ashmead, 1899. Canad. Ent. 31: 218.

Type-species: *Crabro decorus* Fox. Orig. desig.

*Ischnolynthus* Holmberg, 1903. Mus. Nac. Buenos Aires, An. 9: 472.

Type-species: *Ischnolynthus foveolatus* Holmberg. Monotypic.

*Crossocerus* subg. *Yuchiha* Pate, 1944 (1943). Lloydia 6: 272. N. syn. (R. C. Miller).

Type-species: *Crossocerus (Yuchiha) xanthochilos* Pate. Orig. desig.

Relatively little is known of the biology of members of this subgenus. Some species are known to nest in the ground; this is substantiated by some of the morphological features of the females. However, a few species are known to nest in pre-existing burrows in wood above the ground. It is possible that many species utilize pre-existing burrows, modifying them as required as nesting sites. If this is so, perhaps the few species which have been reported as nesting in wood may be found eventually to nest in the ground also.

**chromatipus** Pate. Nev., Calif., Oreg., Wash.

*Crabro pictipes* Fox, 1895. Amer. Ent. Soc., Trans. 22: 187. ♂. Preocc.

*Crossocerus (Crossocerus) chromatipus* Pate, 1944 (1943). Lloydia 6: 280. N. name.

**decorus** (Fox). Nebr., Colo., Utah, west. Tex. to south. Calif., south in Mexico to Chiapas.

Ecology: Nests in sand, clay, and softer spots of rocky root-shrouded stream banks; pre-existing burrows of other insects are used and new side branches are constructed, resulting in twisted burrows 8.5-15.0 cm long, weakly branched, with tight clusters or linear series of cells grouped around end of burrow; up to 9 cells per nest with 8-29 prey per cell. Prey: Chloropidae, Pipunculidae, Stratiomyidae, Ceratopogonidae, Empididae, Sciariidae, Dolichopodidae, Tachinidae, Simuliidae, Tephritidae, Agromyzidae, Chironomidae.

*Crabro decorus* Fox, 1895. Amer. Ent. Soc., Trans. 22: 200. ♀.

Biology: Cockerell, 1898. Davenport Acad. Nat. Sci., Proc. 7: 148 (nest). —Smith, 1908. Nebr. Univ. Studies 8: 395 (nest).

**elongatulus** *elongatulus* Vander Linden. Transit. and U. Austr. Zones, N. S., Que., Ont., Maine to Va. west to Utah and Wash; Palaearctic south of Arctic Circle including North Africa; adventive in Argentina. Ecology: In Europe it is recorded as nesting in soil or wood, and sometimes in pre-existing burrows of wood-boring insects; nests have been found in such odd habitats as soil clinging to roots of fallen trees, old mortar of buildings, crevices in stone walls, and in cracks of rock outcrops; communal nesting has been reported once. Parasite: In Europe a species of *Macronychia* has been recorded. Prey: Chloropidae, Lauxaniidae, Scatopsidae, Cecidomyiidae, Empididae, Phoridae, Dolichopodidae, Syrphidae, Agromyzidae, Milichiidae, Tachinidae, Ephydriidae,

- Drosophilidae*, *Diastatidae*, *Calliphoridae*, *Stratiomyidae*, *Muscidae*, *Sciaridae*, and one record of *Aphidoidea*. Another subspecies occurs in Sicily.
- Crossocerus elongatulus* Vander Linden, 1829. *Nouv. Mem. Acad. Roy. Sci., Belles-Lettres Bruxelles* 5: 64. ♂, ♀.
- Crossocerus varipes* Lepeletier and Brulle, 1834. *Soc. Ent. France, Ann.* 3: 773. ♀, ♂.
- Crossocerus pallidipalpis* Lepeletier and Brulle, 1834. *Soc. Ent. France, Ann.* 3: 779. ♀, ♂.
- Crossocerus morio* Lepeletier and Brulle, 1834. *Soc. Ent. France, Ann.* 3: 781. ♀, ♂.
- Crossocerus affinis* Lepeletier and Brulle, 1834. *Soc. Ent. France, Ann.* 3: 781. ♂.
- Crossocerus luteipalpis* Lepeletier and Brulle, 1834. *Soc. Ent. France, Ann.* 3: 785. ♂.
- Crossocerus annulatus* Lepeletier and Brulle, 1834. *Soc. Ent. France, Ann.* 3: 787. ♀.
- Crabro proximus* Shuckard, 1837. *Essay on Indig. Fossor. Hym.*, p. 156. ♂. This is a questionable synonym.
- Crabro hyalinus* Shuckard, 1837. *Essay on Indig. Fossor. Hym.*, p. 161. ♀.
- Crabro transversalis* Shuckard, 1837. *Essay on Indig. Fossor. Hym.*, p. 162. ♂.
- Crabro obliquus* Shuckard, 1837. *Essay on Indig. Fossor. Hym.*, p. 167. ♀, ♂.
- Crabro propinquus* Shuckard, 1837. *Essay on Indig. Fossor. Hym.*, p. 168. ♂.
- Crossocerus elongatus* Lepeletier, 1845. *Hist. Nat. Ins. Hym.*, v. 3, p. 193. *Lapsus or emend.*
- Crabro scutellaris* Smith, 1851. *List Brit. Anim. Brit. Mus.* 6: 121. ♀. *Preocc.*
- Crabro sulcus* Fox, 1895. *Amer. Ent. Soc., Trans.* 22: 187. ♀.
- Ischnolynthus foveolatus* Holmberg, 1903. *Mus. Nat. Buenos Aires, An.* 9: 472. ♂.
- Stenocrabro plesius* Rohwer, 1912. *U. S. Natl. Mus., Proc.* 41: 472. ♂.
- Crossocerus elongatus berlandi* Richards, 1928. *Soc. Ent. France, Bul.*, p. 223. ♂.
- Biology:** Leclercq, 1954. *Monog. Syst., Phylogen., Zoogeogr. Crabron.*, *Hym.* p. 307 (nest, prey, refs. to biol. in Europe).
- eriogoni** (Rohwer). Alta., Colo., N. Mex., Ariz.; Mexico (Chihuahua, Coahuila, Zacatecas, Durango, Mexico). **Ecology:** Nests in softer spots of rocky root-shrouded stream banks; apparently nests in pre-existing burrows of other insects and makes a sometimes branched burrow 8-16 cm long; makes up to 3 cells per nest in a small cluster at end of burrow and stores 18-22 prey per cell. Prey: *Pipunculidae*, *Chloropidae*, *Tephritidae*, *Empididae*, *Chamaemyiidae*.
- Crabro* (*Crossoceros* (!)) *eriogoni* Rohwer, 1908. *Ent. News* 19: 256. ♀.
- lentus** (Fox). Que. west to B. C., Yukon Terr., N. W. T., Alaska south to Fla. and N. Mex., apparently not occurring west of Rocky Mts. in U. S. **Ecology:** Nests in vertical banks of sand and in stony, root-shrouded banks of firm clayey sand; pre-existing burrows are used and new side branches are constructed with clusters of cells located around, off to the side, or at the end of the main burrow; burrows are 7.0-10.5 cm long, linear or branched; up to 12 cells per nest with 5-30 prey per cell, newly captured prey stored at end of burrow, not in cell. Prey: *Simuliidae*, *Chloropidae*, *Empididae*, *Ceratopogonidae*, *Chironomidae*, *Agromyzidae*.
- Crabro scutellatus* Say, 1824. *In* Keating, *Narr. Long's 2nd Exped.*, v. 2, p. 341. ♀. *Preocc.* N. syn. (R. C. Miller).
- Crabro lentus* Fox, 1895. *Amer. Ent. Soc., Trans.* 22: 190. ♀.
- Crabro scutellifer* Dalla Torre, 1897. *Cat. Hym.*, v. 8, p. 625. N. name. N. syn. (R. C. Miller).
- Biology:** Peckham and Peckham, 1905. *Wasps, Social and Solitary*, p. 101 (nest, prey).
- maculiclypeus** (Fox). Newfoundland west to B. C., Yukon Terr., N. W. T., Alaska, south to Pa. and Kans. in the east, and to N. Mex. and Calif. in the west. **Ecology:** Nests in sparsely vegetated sand, burrows 4.0-11.5 cm long, extremely variable in shape, but main burrow usually enters at acute angle to surface; entrances usually concealed under small sand ledges or leaves, at bases of plants, or in depressions; cells arranged in clusters at the end of or off to the side of the main burrow with up to 9 cells per nest, each cell with 5-20 prey; pre-existing burrows are often used but new burrows are begun in small crevices or depressions in sand; newly captured prey sometimes stored in open cell at end of burrow, sometimes at end of burrow in a section only slightly or not at all widened. Prey: *Helobia* sp., *Molophilus* sp., *Palpomyia* sp., *Cricotopus* sp., *Hydrobaenus* sp., *Chironomidae* sp.; *Bradyia* sp.; *Drapetis* sp., *Hilara femorata* Lw., *Platypalpus*

*holosericus* Mel., *P. cellarius* Mel., *P. xanthopodus* Mel., *Bicellaria pectinata* Mel., *Rhamphomyia* sp.; *Chrysotus* sp., *Peloropecodes* sp., *Thrypticus willistoni* (Wlhr.); *Conioscinella melancholica* Beck., *C. sp.*, *Meromyza* sp., *Oscinella* sp., *Chlorops* sp.; *Agromyza* sp., *Liriomyza* sp., *Melanagromyza* sp., *Ophiomyia labiatarum* Her., *Phytobia* sp., *Phytomyza* sp.; *Psila angustata* Cr., *P. rosae* F.; *Rhagoletis fausta* (O. S.); *Plunomia elegans* Curr.; *Coenosinae* sp.; preferred prey are Brachycera and acalyptrate Cyclorrhapha. Predator: *Philanthus pacificus* Cr.

*Crabro maculiclypeus* Fox, 1895. Amer. Ent. Soc., Trans. 22: 189. ♀, ♂.

*Thyreoptus (Crossocerus) daeckei* Rohwer, 1910. Ent. Soc. Wash., Proc. 12: 51. ♀.

Biology: Kurczewski, Burdick and Gaumer, 1969. N. Y. Ent. Soc., Jour. 77: 92-104, 8 figs.

(nest, prey transport). —Evans, 1970. Mus. Compar. Zool., Bul. 140: 491-492 (nest, prey).

**minimus** (Packard). N. B. to Ont., N. W. T., Maine to N. C. west to S. Dak. and Tex.

*Blepharipus minimus* Packard, 1867. Ent. Soc. Phila., Proc. 6: 377. ♀, ♂.

*Crabro propinquus* Fox, 1895. Amer. Ent. Soc., Trans. 22: 189. ♀. Preocc.

*Crossocerus (Crossocerus) pelas* Pate, 1944 (1943). Lloydia 6: 280. N. name.

**planifemur** Krombein. N. Y. to N. C., W. Va. Ecology: Nests in abandoned beetle borings in logs.

*Crossocerus (Crossocerus) planifemur* Krombein, 1952. Ent. Soc. Wash., Proc. 54: 181. ♀, (♂ misdet.).

*Crossocerus (Crossocerus) spangleri* Krombein, 1962. Biol. Soc. Wash., Proc. 75: 16. ♂, (♀ misdet.). N. syn. (R. C. Miller).

Biology: Krombein, 1952. Ent. Soc. Wash., Proc. 54: 182 (nest).

**planipes** (Fox). Newfoundland to B. C., Yukon, N. W. T., Alaska, Maine to Ga. west to Wash.

and Calif. Ecology: Usually nests in vertical sand or clay banks, but has been found nesting in level or gently sloping bare soil; nests are 10-40 cm long, straight or curved, rarely branched; cells arranged in irregular linear series or tight clusters, up to 7 cells per nest, each new group of cells started at a point farther along main burrow than most recent cell of preceding group; females investigate and eventually renovate pre-existing burrows and holes; 6-20 prey stored per cell; newly captured prey stored in cell at end of burrow or at unwidened end of burrow. Prey: *Procladius bellus* (Lw.), *Chelifera* sp., *Chersodromia* sp., *Drapetis* sp., *Hilara testacea* Lw., *Leptopeza borealis* Zett., *Oedalia ohioensis* Mel., *Platypalpus holosericus* Mel.; *Rhamphomyia pusio* Lw., *Trichina nura* Mel.; *Chrysotus* sp.; *Psila* sp.; *Homoneura disjuncta* (Johns.), *Minettia* sp.; *Meromyza* sp., *Paratecephala sanguinolenta* (Lw.).

*Crabro incavus* Fox, 1895. Amer. Ent. Soc., Trans. 22: 188. ♀.

*Crabro planipes* Fox, 1895. Amer. Ent. Soc., Trans. 22: 193. ♂.

*Crabro (Crossocerus (!)) cockerelli* Rohwer, 1908. Ent. News 19: 255. "♀" = ♂, ♂.

Taxonomy: Bohart and Menke, 1976. Sphecids of world, p. 402 (synonymy).

Biology: Rau, 1922. Acad. Sci. St. Louis, Trans. 24: 21 (nest). —Krombein, 1964. Brooklyn Ent. Soc., Bul. 58: 119-120 (nest, prey).

**similis** (Fox). Ont., Vt. and N. Y. to Fla., Mich., Wis., Ohio, Ill., Tenn.

*Crabro similis* Fox, 1895. Amer. Ent. Soc., Trans. 22: 191. ♀.

*Stenocrabro flavitrochantericus* Viereck, 1904. Amer. Ent. Soc., Trans. 30: 242. ♀.

**wesmaeli** Vander Linden. N. W. T.; widespread in Europe, Russia, Manchuria and Japan.

Ecology: In Europe nests in sand, loess and clay cliffs, cells scattered 2-5 cm below surface, burrows linear or simply branched, up to 9 cells per nest, stores 8-39 prey per cell; newly captured prey stored in open cell at end of burrow. Prey: In Europe Ceratopogonidae, Chironomidae, Cecidomyiidae, Sciaridae, Agromyzidae, Ephydriidae, Tipulidae, Chloropidae, Empididae, Chamaemyiidae, Simuliidae; Psocoptera; Cicadellidae; Anthocoridae.

*Crabro Wesmaeli* Vander Linden, 1829. Nouv. Mem. Acad. Roy. Sci., Belles-Lettres Bruxelles 5: 65. ♀, ♂.

*Ceratocolus Ziegleri* Lepeletier and Brulle, 1834. Soc. Ent. France, Ann. 3: 748. ♀.

*Ceratocolus maurus* Lepeletier and Brulle, 1834. Soc. Ent. France, Ann. 3: 748. ♀.

Biology: Leclercq, 1954. Monog. Syst., Phylogen., Zoogeogr. Hym. Crabron., pp. 307-308 (nest, prey, refs. to biol. in Europe). — Tsuneki, 1960. Fac. Liberal Arts, Fukui Univ., Mem., Ser. 2, No. 10, pp. 47-48 (nest, prey).

**xanthochilos** Pate. Md. to Ga. west to Tex., Mo., Kans., Ill. Ecology: Nests in clay bank. Prey: *Condyllostylus* sp.

*Crossocerus* (*Yuchiha*) *xanthochilos* Pate, 1944 (1943). Lloydia 6: 274. ♀.

Taxonomy: Krombein, 1952. Amer. Ent. Soc., Trans. 78: 96. ♂.

Biology: Rau, 1922. Acad. Sci. St. Louis, Trans. 24: 21 (nest; misdet. as *scutellatus*).

**xanthognathus** (Rohwer). Ariz.; Mexico (Chihuahua).

*Thyreopus* (*Crossocerus*) *xanthognathus* Rohwer, 1911. U. S. Natl. Mus., Proc. 40: 566. ♀.

#### Genus CROSSOCERUS Subgenus ABLEPHARIPUS Perkins

*Ablepharipus* Perkins, 1913. Ent. Soc. London, Trans., p. 390.

Type-species: *Crabro podagricus* Vander Linden. Monotypic.

The European *podagricus* usually nests in abandoned burrows of wood-boring Coleoptera, and provisions the cells with small nematoceros and acalyptrate Diptera. A female of the rare North American *unicus* was collected on the trunk of a dead hemlock, where, presumably, it nested in an abandoned beetle boring.

**unicus** (Patton). Conn., N. Y., Pa., Mich., Ind., Minn., Mont., Man.

*Blepharipus unicus* Patton, 1879. Canad. Ent. 11: 214. ♀.

*Stenocrabro nelli* Viereck, 1904. Amer. Ent. Soc., Trans. 30: 241. ♀.

#### Genus CROSSOCERUS Subgenus EPICROSSOCERUS Ashmead

*Epicrossocerus* Ashmead, 1899. Canad. Ent. 31: 215.

Type-species: *Crabro insolens* Fox. Orig. desig.

**insolens** (Fox). N. Y., Mich., Mo., Colo., Utah, Ariz., Calif., Oreg. Ecology: Nests in *Sambucus* stems. Parasite: *Diomorus zabriskiei* Cr. Prey: *Pachyneuron* sp.; *Tetrastichus pattersonae* Full., T. sp.

*Crabro insolens* Fox., 1895. Amer. Ent. Soc., Trans. 22: 192. ♀.

*Crabro* (*Epicrossocerus*) *universitatis* Rohwer, 1909. Ent. News 20: 152. ♀. N. syn. (R. C. Miller).

*Epicrossocerus rani* Rohwer, 1923. Ent. Soc. Wash., Proc. 25: 99. ♀. N. syn. (R. C. Miller).

Biology: Parker and Bohart, 1966. Pan-Pacific Ent. 42: 94 (nest, prey, parasite).

#### Genus CROSSOCERUS Subgenus HOPLOCABRO Thomson

*Crabro* subg. *Hoplocrabro* Thomson, 1874. Hym. Scand., v. 3, p. 277.

Type-species: *Crabro quadrimaculatus* Fabricius. Monotypic.

The European *quadrimaculatus* nests in sandy soil and provisions with nematoceros and brachycerous Diptera and Trichoptera.

Taxonomy: Pate, 1942. Canad. Ent. 74: 177-185, 5 figs.

**angelicus** (Kincaid). Nebr., Alta., Mont. and Wyo. west to B. C. and north. Calif. Prey: Muscoid Diptera.

*Crabro angelicus* Kincaid, 1900. Ent. News 11: 358. "♀" = ♂.

*Crabro* (*Hoplocrabro*) *vierecki* Smith, 1908. Nebr. Univ. Studies 8: 401. ♀.

*Crabro* (*Hoplocrabro*) *boulderensis* Rohwer, 1909. Ent. News 20: 323. ♂.

*Crabro* (*Hoplocrabro*) *spinibuccus* Viereck, 1909. Ent. Soc. Wash., Proc. 11: 44. ♀.

Biology: Krombein, 1967. U. S. Dept. Agr., Monog. 2, Sup. 2: 420 (prey).

#### Genus CROSSOCERUS Subgenus BLEPHARIPUS Lepeletier and Brulle

*Blepharipus* Lepeletier and Brulle, 1834. Soc. Ent. France, Ann. 3: 728.

Type-species: *Blepharipus nigrita* Lepeletier and Brulle. Desig. by Ashmead, 1899.

*Crabro* subg. *Coelocrabro* Thomson, 1874. Hym. Scand., v. 3, p. 262.



- Type-species: *Crabro pubescens* Shuckard. Desig. by Richards, 1935.  
*Dolichocrabro* Ashmead, 1899. Canad. Ent. 31: 216.  
 Type-species: *Dolichocrabro Wickhamii* Ashmead. Orig. desig.  
*Acanthocrabro* Perkins, 1913. Ent. Soc. London, Trans., p. 391. N. syn. (R. C. Miller).  
 Type-species: *Crabro vagabundus* Panzer. Monotypic.  
*Crossocerus* subg. *Nothocrabro* Pate, 1944 (1943). Lloydia 6: 314. N. syn. (R. C. Miller).  
 Type-species: *Crabro nitidiventris* Fox. Orig. desig.  
*Crossocerus* subg. *Stictoptila* Pate, 1944 (1943). Lloydia 6: 315. N. syn. (R. C. Miller).  
 Type-species: *Crabro confertus* Fox. Orig. desig.  
*Crossocerus* subg. *Neoblepharipus* Leclercq, 1968. Soc. Roy. Sci. Liege, Bul. 27: 98. N. syn. (R. C. Miller).  
 Type-species: *Crossocerus (Neoblepharipus) potosus* Leclercq. Orig. desig.  
*Crossocerus* subg. *Fentis* Tsuneki, 1971. Etizenia 51: 13. N. syn. (R. C. Miller).  
 Type-species: *Crossocerus (Fentis) quinquedentatus* Tsuneki. Orig. desig.  
*Crossocerus* subg. *Bnunius* Tsuneki, 1971. Etizenia 51: 15. N. syn. (R. C. Miller).  
 Type-species: *Crossocerus (Bnunius) domicola* Tsuneki. Orig. desig.

These species nest in the soft pith of plant stems or twigs, or in decaying wood. Most species make a series of linear cells separated by partitions of particles of the substrate.

Revision: Pate, 1944 (1943). Lloydia 6: 290-312 (N. Amer. spp.).

**annulipes** (Lepeletier and Brulle). N. S. to B. C. south to Ga., Utah, Nev. and Calif.; widely distributed in Palaearctic Region except Japan. Ecology: In North America nests in rotting stumps and logs, and in old anobiid burrows in structural timber, stores 4-46 prey per cell. Prey: *Alebra albostrigella* (Fall.), *Riboutiana* ? sp., *Empoa* ? sp., *Empoasca alboneura* Gill., *E. bifurcata* DeL., *E. bipunctata* (Osh.), *E. birdii* Godg., *E. erigeron* DeL., *E. fabae* Harr., *E. gelbata* DeL. and Dav., *E. livingstoni* Gill., *E. maligna* Walsh, *E. obtusa* Walsh, *E. patula* DeL., *E. pergandei* Gill., *E. solana* DeL., *E. spp.*, *Edwardsiana rosae* (L.), *Typhlocyba gillettei* Van D., *T. pomaria* McAtee, *T. australis* Frogg., *T. modesta* Gibson, *T. melite* McAtee, *T. sp.* or *Ossiannilssonola* sp., *Erythroneura comes* (Say), *E. confirmata* McAtee, *E. dowelli* Beamer, *E. lawsoniana* Baker, *E. tricornata* Fitch, *E. vulnerata* Fitch, *E. ziczac* Walsh, *E. lawsoni* Rob., *E. vitis* (Harr.), *E. hartii* (Gill.), *E. magnacalx* Beamer, *E. elegans* McAtee, *E. rubra* (Gill.), *E. albescens* Beamer; adults are the preferred prey but some nymphs are stored; many other leafhoppers are recorded as prey in Europe; Miridae sp.; Chironomidae sp.  
 Another subsp. occurs in Japan.

- Blepharipus annulipes* Lepeletier and Brulle, 1834. Soc. Ent. France, Ann. 3: 729. ♀.  
*Crossocerus gonager* Lepeletier and Brulle, 1834. Soc. Ent. France, Ann. 3: 785. ♀.  
*Crabro nigratus* Gimmerthal, 1836. Soc. Imp. Nat. Moscow, Bul. 9: 435.  
*Crabro ambiguus* Dahlbom, 1842. Dispos. Method. Spec. Scand. Ins. Hym., p. 14. ♀.  
*Crabro (Crossocerus) capito* Zeller, 1845. In Dahlbom, Hym. Europaea, v. 1, p. 524.  
*Blepharipus parkeri* Banks, 1921. Ent. Soc. Amer., Ann. 14: 17. ♀.  
*Crabro (Blepharipus) davidsoni* Sandhouse, 1938. Ent. Soc. Amer., Ann. 31: 1. ♀, ♂.

Taxonomy: Evans, 1957. Amer. Ent. Soc., Trans. 83: 106, figs. 69-74 (larva).

Biology: Davidson and Landis, 1938. Ent. Soc. Amer., Ann. 31: 5-8, 3 figs. (nest, prey, life cycle). — Krombein, 1958. Biol. Soc. Wash., Proc. 71: 26 (nest, prey, life cycle). — Michener, 1971. Kans. Ent. Soc., Jour. 44: 405-407 (nest, prey).

**barbipes** (Dahlbom). Que. to B. C., Alaska, Yukon Terr. south to N. C., Tenn., and S. Dak., in mts. to N. Mex. and Calif.; north. Palaearctic, Lapland and Holland to Japan. Ecology: Nests in hole in wooden shingle and in twigs of *Salix* and *Sambucus*, and in dead standing tree. Prey: *Empoasca* sp., possibly *obtusa* Walsh or *patula* DeL.; in Japan preys upon small Diptera, storing 3-6 prey per cell.  
*Crabro barbipes* Dahlbom, 1845. Hym. Europaea, v. 1, p. 521. ♂.  
*Crabro ater* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 477. ♀. Preocc. N. syn. (R. C. Miller).  
*Crabro hirtipes* Morawitz, 1866. Acad. Imp. Sci. St. Petersburg, Bul. 9: 258. ♂.  
*Dolichocrabro Wickhamii* Ashmead, 1899. Canad. Ent. 31: 215. ♂. N. syn. (R. C. Miller).  
*Dolichocrabro wickhami* Ashmead, 1902. Wash. Acad. Sci., Proc. 4: 133. ♂. Preocc. N. syn. (R. C. Miller).

- Crossocerus (Blepharipus) pammelas* Pate, 1944 (1943). *Lloydia* 6: 299. N. name. N. syn. (R. C. Miller).
- Biology: Steyskal, 1944. Brooklyn Ent. Soc., Bul. 39: 170 (nest, prey). —Tsuneki, 1960. *Fac. Lib. Arts Fukui Univ., Mem. Ser. 2, Nat. Sci. (10)* 1: 42 (nest, prey).
- cinctipes** (Provancher). Newfoundland, N. B., N. S. west to Alaska, Yukon Terr., N. W. T., south to Md., Mich., Minn. and in the mts. to N. Mex. and Calif.
- Plepharipus*(!) *cinctipes* Provancher, 1882. *Nat. Canad.* 13: 133. ♂.
- Crabro niger* Provancher, 1888. *Addit. Corr. Faune Ent. Canada Hym.*, p. 419. ♀. Preocc.
- Crabro nigror* Fox, 1895. *Amer. Ent. Soc., Trans.* 22: 196. ♀.
- Crabro nigror* Fox, 1896. *Amer. Ent. Soc., Trans.* 23: 80. Emend.
- Crabro servus* Dalla Torre, 1897. *Cat. Hym.*, v. 8, p. 626. N. name.
- Stenocrabro cinctitarsis* Ashmead, 1901. *Psyche* 9: 185. ♂.
- Blepharipus columbiae* Bradley, 1906. *Canad. Ent.* 38: 380. ♀.
- Thyreopus (Blepharipus) utensis* Mickel, 1916. *Amer. Ent. Soc., Trans.* 42: 421. ♀.
- Thyreopus* (subgenus?) *stygius* Mickel, 1916. *Amer. Ent. Soc., Trans.* 42: 422. ♀.
- fergusoni** Pate. Utah, Nev., Calif., Oreg. Ecology: Nests in *Sambucus* stems. Parasite: *Diomorus zabriskiei* Cr.; *Amobia floridensis* (Tns.), *Macronychia* sp. Prey: Stratiomyidae ? sp.; Empididae; Muscoid Diptera.
- Crossocerus (Blepharipus) fergusoni* Pate, 1944 (1943). *Lloydia* 6: 307. ♂.
- Taxonomy: Evans, 1957. *Amer. Ent. Soc., Trans.* 83: 107, figs. 97-98 (larva). —Evans, 1959. *Amer. Ent. Soc., Trans.* 85: 165, fig. 61 (larva).
- Biology: Krombein, 1951. U. S. Dept. Agr., Monog. 2: 1022 (prey). —Parker and Bohart, 1966. *Pan-Pacific Ent.* 42: 94 (nest, parasites).
- harringtonii** (Fox). Que. west to B. C., south to Ga., Tenn., Kans. and Mont. Ecology: Reared from branches of white oak.
- Crabro Harringtonii* Fox, 1895. *Amer. Ent. Soc., Trans.* 22: 195. ♀.
- Taxonomy: Krombein, 1952. *Ent. Soc. Wash., Proc.* 54: 184. ♂.
- impressifrons** (Smith). Ont., Mass. south to Fla., west to Nebr. and Ark. Ecology: Nests in rotten log and in dense frass beneath tight bark of dead American elm logs, and in hickory; one nest 10 cm long, branching and with 6 cells, some in linear series. Prey: *Condyllostylus* sp., *Dolichopodidae* sp.; Tephritidae; Empididae; Syrphidae; Chironomidae; Trichoptera sp.
- Crabro tibialis* Say, 1824. *In* Keating, Narr. Long's 2nd Exped., v. 2, p. 340. ♀. Preocc.
- Crabro pusillus* Harris, 1835. *In* Hitchcock, Rpt. Geol., Mineral. Bot. Zool. Mass., p. 68. Nom. nud.
- Crabro impressifrons* Smith, 1856. *Cat. Hym. Brit. Mus.*, v. 4, p. 417. N. name.
- Blepharipus scutellatus* Packard, 1867. *Ent. Soc. Phila., Proc.* 6: 375. ♂. Preocc.
- Blepharipus Harrisii* Packard, 1867. *Ent. Soc. Phila., Proc.* 6: 376. ♂.
- Crabro (Blepharipus) tridentatus* Rohwer, 1909. *Ent. News* 20: 150. ♀, ♂. Preocc.
- maculipennis** (Smith). Que. to B. C. south to Va., W. Va., Ill., Minn. and in mts. to N. Mex. and Calif. Ecology: Nests in cavities in log and old apple tree. Prey: *Nephrotoma tenuis* (Lw.), *Pales ferrugineus* (F.), Tipulidae sp.
- Blepharipus maculatus* Lepeletier and Brulle, 1834. *Soc. Ent. France, Ann.* 3: 730. ♀. Preocc.
- Crabro pictus* Smith, 1856. *Cat. Hym. Brit. Mus.*, v. 4, p. 417. N. name. Preocc.
- Crabro maculipennis* Smith, 1856. *Cat. Hym. Brit. Mus.*, v. 4, p. 417. N. name.
- Crabro confertus* Fox, 1895. *Amer. Ent. Soc., Trans.* 22: 181. ♀, ♂.
- Crabro ventralis* Fox, 1895. *Amer. Ent. Soc., Trans.* 22: 183. ♀.
- Crabro canonicola* Viereck, 1908. *Amer. Ent. Soc., Trans.* 33: 402. ♀.
- Crabro albertus* Carter, 1925. *Canad. Ent.* 57: 135. ♂.
- Biology: Erikson, 1940. Brooklyn Ent. Soc., Bul. 35: 172 (nest, prey). —Krombein, 1951. U. S. Dept. Agr., Monog. 2: 1023 (prey).
- maculitarsis** (Cameron). Ariz., Tex.; Mexico (Guerrero, Morelos, Chiapas). Ecology: Reared from *Quercus*.
- Crabro maculitarsis* Cameron, 1891. *Biol. Cent.-Amer., Hym.*, v. 2, p. 154. ♀.

**melanius** (Rohwer). Alta., Colo., N. Mex., Ariz.; Mexico (Chihuahua, Durango, Morelos).

*Thyreopus (Blepharipus) melanius* Rohwer, 1911. U. S. Natl. Mus., Proc. 40: 565. ♀, ♂.

**nigricornis** (Provancher). Newfoundland to B. C., Yukon and Alaska, south to N. C., Tenn., Nebr., in mts. south to N. Mex. and Calif. Ecology: Nests in *Sambucus* stems and in twig of living box elder tree; one nest 20.5 cm long, linear, contained 11 cells each with 6-14 prey per cell. Prey: Primarily Dolichopodidae and Empididae especially *Platypalpus* sp., but also Ceratopogonidae, Mycetophilidae, Chironomidae, Tipulidae, Phoridae, Chloropidae, other acalyptrate Cyclorrhapha, Muscidae and Anthomyiidae. *Blepharipus nigricornis* Provancher, 1888. Addit. Corr. Faune Ent. Canada Hym., p. 294. ♂.

Biology: Pate, 1944 (1943). Lloydia 6: 306-307 (nest, prey).

**nitidiventris** (Fox). Que. and Ont. to Ga. west to Minn. and Tex. Prey: *Nephrotoma virescens* Lw., Tipulidae sp.

*Crabro nitidiventris* Fox, 1892. Ent. News 3: 9. ♀.

Taxonomy: Krombein, 1953. Wasmann Jour. Biol. 10: 338. ♀.

Biology: Krombein, 1967. U. S. Dept. Agr., Monog. 2, Sup. 2, p. 420 (prey).

**stictochilos** Pate. Mass. to Ga., Mich., Ill., Ark. Ecology: Nests in pith of green *Hibiscus* stem. Prey: Diptera.

*Crossocerus (Blepharipus) stictochilos* Pate, 1944 (1943). Lloydia 6: 304. ♀, ♂.

Biology: Krombein, 1964. Biol. Soc. Wash., Proc. 77: 90 (nest, prey, cocoon, life cycle).

**stricklandi** Pate. Alta., B. C., Wyo., Colo., Utah.

*Crossocerus (Blepharipus) stricklandi* Pate, 1944 (1943). Lloydia 6: 301. ♂.

**tarsalis** (Fox). Que., Ont., Maine south to Ga., west to Tenn., Mo., Mich., Colo., Idaho.

*Crabro tarsalis* Fox, 1895. Amer. Ent. Soc., Trans. 22: 193. ♂.

#### Genus TRACHELIODES Morawitz

*Crabro* subg. *Brachymerus* Dahlbom, 1845, Hym. Europaea, v. 1, p. 519. Preoce.

Type-species: *Crabro (Brachymerus) Megerlei* Dahlbom. Monotypic.

*Tracheliodes* Morawitz, 1866. Acad. Imp. Sci. St. Petersburg, Bul. 9: 249.

Type-species: *Brachymerus megerlei* Dahlbom. Desig. by Ashmead, 1899.

*Fertonius* Perez, 1892. In Ferton, Soc. Linn. Bordeaux, Actes 44: 341.

Type-species: *Crossocerus luteicollis* Lepeletier and Brulle. Desig. by Pate, 1937.

Our species nest in plant stems or borings in wood, but one European species is known to nest in soil, another in abandoned beetle borings. Our species prey upon worker ants of the genus *Liometopum*; European species use workers of both *Liometopum* and *Tapinoma*.

Revision: Pate, 1942. Lloydia 5: 222-224, 7 figs. (N. Amer. spp.).

**amu** Pate. N. Mex., Ariz. Ecology: Nests in borings in wood, constructs a brood chamber in which 1-3 wasps develop, stores as many as 42 prey per egg. Prey: *Liometopum occidentale luctuosum* Whlr. workers.

*Tracheliodes amu* Pate, 1942. Lloydia 5: 235. ♂.

Taxonomy: Evans, 1964. Amer. Ent. Soc., Trans. 90: 290-291, figs. 104-109 (larva).

Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 257-259, figs. 68, 69 (nest, prey, life cycle, cocoon).

**foveolineatus** (Viereck). Colo., Oreg., Calif. Ecology: Nests in *Sambucus* stems. Prey: *Liometopum occidentale luctuosum* Whlr. workers.

*Crabro (Cuphopterus) foveolineatus* Viereck, 1909. Ent. Soc. Wash., Proc. 11: 44. ♀.

Biology: Parker and Bohart, 1966. Pan-Pacific Ent. 42: 95 (nest, prey).

**hicksi** Sandhouse. Colo., Ariz. Prey: *Liometopum* sp. workers.

*Tracheliodes hicksi* Sandhouse, 1936. Ent. News 47: 2. ♀.

Biology: Hicks, 1936. Ent. News 47: 4-7 (prey capture).

## Genus CRABRO Fabricius

- Crabro* Fabricius, 1775. *Systema Ent.*, p. 373. Preocc., but placed on Official List of Generic Names of Internatl. Comn. Zool. Nomencl., 1936., Op. 144.  
Type-species: *Vespa cribraria* Linnaeus. Desig. by Internatl. Comn. Zool. Nomencl., 1943.
- Carabro* Say, 1823. *West. Quart. Rptr.* 2: 78. Lapsus.
- Crabro* subg. *Thyreopus* Lepeletier and Brulle, 1835. *Soc. Ent. France, Ann.* 3: 519.  
Type-species: *Spheg cribrarius* (Linnaeus). Desig. by Westwood, 1839.
- Crabro* subg. *Thyreocnemus* Costa, 1871. *Mus. Zool. Napoli, Ann.* 6: 64.  
Type-species: *Crabro pugillator* Costa. Monotypic.
- Anothyreus* Dahlbom, 1845. *Hym. Europaea*, v. 1, p. 526.  
Type-species: *Anothyreus lapponicus* of Dahlbom. Desig. by Ashmead, 1899.
- Paranothyreus* Ashmead, 1899. *Canad. Ent.* 31: 213.  
Type-species: *Crabro hilaris* Smith. Orig. desig.
- Synothyreopus* Ashmead, 1899. *Canad. Ent.* 31: 213.  
Type-species: *Thyreopus tumidus* Packard. Orig. desig.
- Pemphilis* Pate, 1944. *Amer. Midland Nat.* 31: 340.  
Type-species: *Vespa cribraria* Linnaeus. Orig. desig.
- Dyscolocrabro* Pate, 1944. *Amer. Midland Nat.* 31: 349.  
Type-species: *Crabro chalybeus* Kohl. Orig. desig.
- Agnosicrabro* Pate, 1944. *Amer. Midland Nat.* 31: 349.  
Type-species: *Crabro occultus* Fabricius. Orig. desig.
- Hemithyreopus* Pate, 1944. *Amer. Midland Nat.* 31: 349.  
Type-species: *Crabro (Ceratocolus) Loewi* Dahlbom. Orig. desig.
- Parathyreopus* Pate, 1944. *Amer. Midland Nat.* 31: 349.  
Type-species: *Crabro filiformis* Radoszkowski. Orig. desig.
- Pemphilis* subg. *Norumbega* Pate, 1947. *Notulae Nat.* 185: 12.  
Type-species: *Thyreopus argus* Packard. Orig. desig.

Subgenera have frequently been recognized in this large genus, but Bohart and Menke believe that on morphological grounds it is preferable to recognize only species groups. This concept is substantiated by a consideration of the ethology, for clearcut differences have not been demonstrated for the several species groups. These wasps nest in the soil, usually constructing multicellular nests, some nesting gregariously, others are solitary. The prey consists of Diptera and, frequently, each species has preferences for flies belonging to one or another suborder or section.

**Biology:** Kurczewski and Acciavatti, 1968. *N. Y. Ent. Soc., Jour.* 76: 196-212 (nesting behavior of *N. Amer.* spp.).

## SPECIES GROUP HILARIS

This is the equivalent of *Paranothyreus* Ashm.

- aequalis* Fox. U. S. east of 100th meridian, north to N. J. and N. Dak., south to Fla.  
*Crabro aequalis* Fox, 1895. *Amer. Ent. Soc., Trans.* 22: 164. ♀.  
*Paranothyreus rugicollis* Viereck, 1904. *Amer. Ent. Soc., Trans.* 30: 241. ♂.  
*Thyreopus* (subgenus?) *knoxensis* Mickel, 1916. *Amer. Ent. Soc., Trans.* 42: 424. ♂.  
*cingulatus* (Packard). N. J. to Ala. west to Wis., Nebr., Tex.; Mexico. Ecology: Nests in vertical sand banks, makes 2-8 cells per nest, stores 11-20 flies per cell. Prey: *Paralimna punctipennis* (Wied.).  
*Thyreopus cingulatus* Packard, 1867. *Ent. Soc. Phila., Proc.* 6: 366. ♂, (♀ misdet.).  
*Crabro clarconis* Viereck, 1906. *Amer. Ent. Soc., Trans.* 32: 213. ♀.

**Biology:** Rau and Rau, 1918. *Wasp Studies Afield*, pp. 96-101, figs. 24-26 (nest, prey transport). —Rau, 1938. *Ent. Soc. Amer., Ann.* 31: 543.

- cognatus* Fox. Alta., U. S. except Pacific States, N. H. to Ga. west to Mont., Utah and Tex.  
*Crabro cognatus* Fox, 1895. *Amer. Ent. Soc., Trans.* 22: 178. ♀, ♂.  
*hilaris* Smith. N. J. to Fla., Ill., Nebr., Tex.  
*Crabro hilaris* Smith, 1856. *Cat. Hym. Brit. Mus.*, v. 4, p. 416. ♀.

**rufibasis** (Banks). Fla. Ecology: Nests in vertical face of sand pit. Prey: *Furcifer pictipennis* (Wied.), *Psilocephala festina* (Coq.), *P. notata* (Wied.); Bombyliidae sp.; *Chrysotus discolor* Lw., *Condylotylus caudatus* (Wied.), *C. chrysoprasi* (Wlkr.), *C. graenicheri* (Van D.), *Plagioneurus univittatus* Lw.; *Allograpta obliqua* (Say), *Baccha costata* Say, *B. sp.* near *loewi* Sedman, *Mesograpta* spp., *Mixogaster* sp., *Toromerus* sp.; *Euxesta basalis* (Wlkr.), *E. eluta* Lw., *E. notata* (Wied.); *Xanthaciura insecta* (Lw.); *Atrichomelina pubera* (Lw.); *Homoneura* sp., *Poecilominettia valida* (Wlkr.); *Pholeomyia decorior* Steysk., *P. dispar* (Beck.); *Chlorops abdominalis* Coq.; *Pegomya gopheri* Johns.; *Atherigona orientalis* Schin., *Coenosia* spp., *Coenosopsia prima* Mall., *Fannia* sp., *Gymnodia arcuata* (Stein), *G. cilifera* (Mall.), *G. debilis* (Will.), *Limnophora narona* (Wlkr.), *Ophya aenesens* (Wied.), *Orthellia caesarion* (Meig.); *Cochliomyia macellaria* (F.), *Phaenicia cluvia* (Wlkr.); *Johnsonia elegans* Coq., *Ravinia derelecta* (Wlkr.); *Acronarista cornuta* Reinh., *Actia* sp., *Catharosia nebulosa* (Coq.), *Chaetonoderodes vanderwulpi* (Tns.), *Chaetophlepsis townsendi* (Sm.), *Clausicella floridensis* (Tns.), *Elfia mellissopodis* (Coq.), *Exoristoides* sp., *Gaediopsis flavipes* Coq., *Leskiella brevivittata* James, *Lespesia aletiae* (Riley), *Lixophaga mediocris* Ald., *Lidella* sp. near *thomsoni* Hert., *Medina* sp., *Mianimyia cincta* Tns., *Paradidyma singularis* (Tns.), *Phasiopsis floridana* Tns., *Pseudochaeta* sp. near *finalis* Reinh., *Pseudomyiothyria ancilla* (Wlkr.), *Prophryno parviteres* (Ald. and Webb.), *Trichopoda plumipes* (F.).

*Thyreopus rufibasis* Banks, 1921. Ent. Soc. Amer., Ann. 14: 17. ♀.

**snowii** Fox. N. Y., Md., Va., Minn., Kans.

*Crabro snowii* Fox, 1896. Amer. Ent. Soc., Trans. 23: 79. ♀, ♂.

#### SPECIES GROUP TUMIDUS

This is *Synothyreopus* Ashm., in part.

**lacteipennis** Rohwer. Tex., Colo., Ariz.; Mexico (Nuevo Leon, Durango).

*Crabro (Thyreopus) lacteipennis* Rohwer, 1909. Ent. News 20: 150. ♀.

**peltista** Kohl. Tex., Ariz.; Mexico to Nicaragua.

*Crabro (Thyreopus) peltista* Kohl, 1888. Zool. Jahrb., Ztschr. f. System. 3: 586. ♀, ♂.

*Crabro incertus* Fox, 1895. Amer. Ent. Soc., Trans. 22: 174. ♀ (♂ misdet.).

**tenuiglossa** Packard. Ont., Mich., Ill., Minn., N. Dak., S. Dak., Alta.

*Crabro tenuiglossa* Packard, 1866. Ent. Soc. Phila., Proc. 6: 98. ♀.

*Thyreopus discifer* Packard, 1867. Ent. Soc. Phila., Proc. 6: 363. ♂.

**tumidus** (Packard). N. Y. to S. C., Ill., Nebr.

*Thyreopus tumidus* Packard, 1867. Ent. Soc. Phila., Proc. 6: 364. ♀, ♂.

#### SPECIES GROUP ADVENA

This is *Synothyreopus* Ashm., in part.

**advena** Smith. South. Canada and U. S. east of 100th meridian. Ecology: Nests in hard clay

loam or sand, makes 2 to more than 16 cells per nest, stores 1-10 prey per cell. Prey:

*Chrysopilus proximus* (Wlkr.), *Symphoromyia pluralis* (Curr.); *Chrysops univittata*

(Macq.), *Otitidae* sp.; *Pegomya finitima* Stein, *P. lipsia* (Wlkr.), *Hydrophoria conica*

(Wied.), *Anthomyiidae* sp.; *Muscina assimilis* (Fall.), *Musca autumnalis* DeG., *M.*

*domestica* L., *Coenosia tigrina* (F.), *Fannia scalaris* (F.); *Pollenia rudis* (F.), *Phaenicia*

*sericata* (Meig.), *Calliphoridae* sp.; *Sarcophaga scoparia* Pand., *S. sp.*, *Senotainia* sp.;

*Belvosia unifasciata* Desv., *Aplomyiopsis* sp., *Lespesia* sp., *Blondeliini* sp.; preferred

prey are calyptate Cyclorrhapha but Orthorrhapha are also used.

*Crabro pegasus* Harris, 1835. In Hitchcock, Rpt. Geol. Mineral. Bot. Zool. Mass., p. 68. Nom. nud.

*Crabro advena* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 421. ♀ (♂ misdet.).

*Crabro succinctus* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 479. ♀.

*Thyreopus signifer* Packard, 1867. Ent. Soc. Phila., Proc. 6: 361. ♀, ♂.

*Thyreopus pegasus* Packard, 1867. Ent. Soc. Phila., Proc. 6: 362. ♀, ♂.

*Thyreopus elegans* Provancher, 1883. Faune Ent. Canada, Hym., p. 665. ♀, ♂.

*Crabro discretus* Fox, 1895. Amer. Ent. Soc., Trans. 22: 165. ♀.

Taxonomy: Evans, 1957. Amer. Ent. Soc., Trans. 83: 104, figs. 95-96 (larva). — Evans, 1959. Amer. Ent. Soc., Trans. 85: 164, figs. 47, 48 (larva).

Biology: Patton, 1897. Canad. Ent. 29: 248 (nest, prey). — Krombein, 1951. U. S. Dept. Agr., Monog. 2: 1017 (prey). — Krombein, 1958. Ent. Soc. Wash., Proc. 60: 53 (prey). — Evans, 1960. N. Y. Ent. Soc., Jour. 68: 123-127, fig. 1 (nest, prey transport, egg, larval life). — Kurczewski and Acciavatti, 1968. N. Y. Ent. Soc., Jour. 76: 200-209, figs. 1-11 (nest, prey transport, egg). — Kurczewski, Burdick and Gaumer, 1969. N. Y. Ent. Soc., Jour. 77: 152-170, figs. 1-8 (nest, prey transport, egg).

**bruneri** (Mickel). Nebr., Oreg.

*Thyreopus (Synothyreopus) bruneri* Mickel, 1916. Amer. Ent. Soc., Trans. 42: 422. ♀, ♂.

**florissantensis** Rohwer. Colo. and Wyo. to Oreg. and Wash. Predator: *Philanthus pulcher* D. T.

*Crabro (Synothyreopus) florissantensis* Rohwer, 1909. Ent. News 20: 149. ♂.

**henrici** Krombein. N. J., Va.

*Thyreopus (Synothyreopus) vierecki* Rohwer, 1910. Ent. Soc. Wash., Proc. 12: 50. ♂. Preocc.

*Crabro (Synothyreopus) henrici* Krombein, 1951. U. S. Dept. Agr., Monog. 2: 1016. N. name.

**hispidus** Fox. Oreg., Wash., B. C.

*Crabro hispidus* Fox, 1895. Amer. Ent. Soc., Trans. 22: 192. ♀.

**vernalis** (Packard). Transcont. in N. Amer. in Transit. Zone including Alaska.

*Thyreopus vernalis* Packard, 1867. Ent. Soc. Phila., Proc. 6: 369. ♀.

*Crabro (Thyreopus) brachycarpae* Rohwer, 1908. Ent. News 19: 252. ♂.

*Crabro (Paranothyreus) gillettei* Rohwer, 1908. Ent. News 19: 418. ♀.

**virgatus** Fox. Calif., Nev., Oreg., Idaho, Alta.

*Crabro virgatus* Fox, 1895. Amer. Ent. Soc., Trans. 22: 174. ♂.

*Crabro velis* Carter, 1925. Canad. Ent. 57: 134. ♂.

#### SPECIES GROUP THYREOPHORUS

This is *Synothyreopus* Ashm., in part.

**thyreophorus** Kohl. Nev., Calif., Oreg.

*Crabro (Thyreopus) thyreophorus* Kohl, 1888. Zool. Jahrb., Ztschr. f. System. 3: 585, pl. 14. ♀, ♂.

#### SPECIES GROUP CRIBRARIUS

This is *Crabro* F., sens. str., and *Norumbega* Pate.

**argusinus** Bohart. Transcont. in south. Canada and U. S. Ecology: Nests in sand, makes 1-4 or more cells per nest, stores 10-19 flies per cell. Parasite: *Senotainia* sp. near *trilineata* (Wulp), *Phrosinella fumosa* Allen ? Prey: *Dolichopus coerens* Wlkr., *D. gladius* Van D., *D. sp.*, *Rhaphium vanduzeei* Curr., *Argyra albicans* Lw., *A. calceata* Lw., *Hercostomus barbatulus* Lw., *H. crassicauda* Lw., *H. frequens* Lw., *H. ornatus* Van D., *Liancalus genualis* Lw., *Plastoneurus vagans* Lw.; *Parydra bituberculata* Lw., *P. borealis* Cr., *P. breviceps* Lw.; *Lispe albitarsis* Stein, *L. nasoni* Stein; Dolichopodidae are the preferred prey, but some Ephyridae and a few Muscidae are also used.

*Crabro argus* Harris, 1835. In Hitchcock, Rpt. Geol. Mineral. Bot. Zool. Mass., p. 68. Nom. nud.

*Thyreopus argus* Packard, 1867. Ent. Soc. Phila., Proc. 6: 359. ♂. Preocc.

*Crabro argusinus* Bohart, 1976. In Bohart and Menke, Sphecid wasps of world, p. 407. N. name.

Taxonomy: Evans, 1959. Amer. Ent. Soc., Trans. 85: 164, figs. 49, 50 (larva).

Biology: Hartman, 1905. Tex. Acad. Sci., Trans. 7: 44 (prey, nest). — Dow, 1930. Psyche 37: 181 (prey). — Evans, 1960. N. Y. Ent. Soc., Jour. 68: 129-132, fig. 1 (nest, prey, parasites).

**conspicuous** Cresson. Colo., Nev., Calif., Wash., Alta.

*Crabro conspicuus* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 480. ♀.

*Crabro medius* Fox, 1895. Amer. Ent. Soc., Trans. 22: 167. ♂.

- cribrellifer** (Packard). N. H. to Fla., Ont., Mich., Ind. Prey: *Ommatius tibialis* Say, *Tolmerus novaescotiae* (Macq.).  
*Thyreopus cribrellifer* Packard, 1867. Ent. Soc. Phila., Proc. 6: 358. ♂.  
*Thyreopus sinuatus* Provancher, 1883. Faune Ent. Canada, Hym., p. 664. ♀. Preocc.  
*Crabro Provancheri* Fox, 1895. Amer. Ent. Soc., Trans. 22: 168. N. name.
- Biology: Krombein, 1951. U. S. Dept. Agr., Monog. 2: 1017 (prey). — Kurczewski and Acciavatti, 1968. N. Y. Ent. Soc., Jour. 76: 198 (prey).
- juniatæ** Krombein. Pa., Va., W. Va. Prey: *Hylemya cilicrura* (Rond.).  
*Crabro (Crabro) juniatæ* Krombein, 1938. Ent. Soc. Amer., Ann. 31: 469. ♀.
- Biology: Krombein, 1952. Ent. Soc. Wash., Proc. 54: 181 (prey).
- largior** Fox. U. S., transcont. in Transit. Zone.  
*Crabro largior* Fox, 1895. Amer. Ent. Soc., Trans. 22: 161. ♀, ♂.
- latipes** Smith. Transcont. in Alaska, Canada, U. S. in Transit. and Canad. Zones. Ecology: Nests in sand, makes 8 or more cells per nest, stores 6-10 flies per cell. Prey: *Platycheirus peltatus* (Meig.); *Symphoromyia pluralis* Curr.; *Dolichopus adultus* Van D., *D. nigricornis* Meig., *D. nodipennis* Van D., *D. remus* Van D., *D. socius* Lw., *Gymnopternus spectabilis* Lw., *Rhaphium armatum* Curr., *R. crassipes* (Meig.); *Musca domestica* L., *M. autumnalis* DeG., *Fannia maniceta* (Meig.), *Muscina assimilis* (Fall.), *Phaonia byisia* (Wlkr.); *Lucilia illustris* (Meig.); *Aplomyiopsis* sp., *Icteriophyto tibialis* (Curr.), *Oswaldia assimilis* (Tns.); *Hydrophoria conica* (Wied.), *Hylemya setigera* (Joh.), *H. stratifrons* Huck., *Pegomya affinis* Stein, *P. lipsia* (Wlkr.); preferred prey are calyptrate Cyclorrhapha, but Orthorrhapha are also used. Predator: *Philanthus zebratus nitens* (Bks.).  
*Crabro gryphus* Harris, 1835. In Hitchcock Rpt. Geol. Mineral. Bot. Zool. Mass., p. 68. Nom. nud.
- Crabro latipes* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 396. ♂.  
*Crabro vicinus* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 479. ♀.  
*Thyreopus coloradensis* Packard, 1867. Ent. Soc. Phila., Proc. 6: 356. ♂.  
*Thyreopus elongatus* Provancher, 1888. Addit. Corr. Faune Ent. Canada, Hym., p. 293. ♂.  
*Crabro canadensis* Dalla Torre, 1897. Cat. Hym., v. 8, p. 585. N. name.  
*Crabro (Anothyreus) viciniformis* Viereck, 1907. Amer. Ent. Soc., Trans. 33: 381. ♀.  
*Crabro pratus* Carter, 1925. Canad. Ent. 57: 133. ♀.
- Biology: Krombein, 1951. U. S. Dept. Agr., Monog. 2: 1017 (prey). — Krombein, 1955. Brooklyn Ent. Soc., Bul. 50: 17 (prey). — Kurczewski and Acciavatti, 1968. N. Y. Ent. Soc., Jour. 76: 199 (prey). — Kurczewski, Burdick and Gaumer, 1969. N. Y. Ent. Soc., Jour. 77: 152-170, figs. 1, 3-8 (nest, prey transport, egg).
- monticola** (Packard). Alaska, Canada, Maine to Ga. Ecology: Nests in sand or gravel road, makes 11 to 15 or more cells per nest, stores 3-5 flies per cell. Prey: *Tabanus lasiophthalmus* Macq., *T. microcephalus* O. S., *Stonemyia tranquilla* (O. S.), *Chrysops celer* O. S., *C. venus* Phil.; *Thereva* sp.; preferred prey are tabanid males.  
*Thyreopus monticola* Packard, 1867. Ent. Soc. Phila., Proc. 6: 367. ♀.
- Taxonomy: Evans, 1959. Amer. Ent. Soc., Trans. 85: 163, figs. 43-46 (larva).
- Biology: Evans, 1960. N. Y. Ent. Soc., Jour. 68: 127-129, fig. 1 (nest, prey transport, cocoon). — Pechuman, 1963. N. Y. Ent. Soc., Jour. 71: 218-219 (nest, prey).
- pallidus** Fox. Mont., Oreg.  
*Crabro pallidus* Fox, 1895. Amer. Ent. Soc., Trans. 22: 163. ♀, ♂.
- pleuralis** Fox. Nebr., Colo., Wyo., Alta., B. C., Wash., Oreg. Predator: *Philanthus zebratus nitens* (Bks.).  
*Crabro pleuralis* Fox, 1895. Amer. Ent. Soc., Trans. 22: 162. ♀, ♂.
- tenuis** Fox. Mich. to Colo. and Wash., Alta.  
*Crabro tenuis* Fox, 1895. Amer. Ent. Soc., Trans. 22: 166. ♀, ♂.
- villosus** Fox. Calif. (Los Angeles Co.).  
*Crabro villosus* Fox, 1895. Amer. Ent. Soc., Trans. 22: 158. ♀.

**Genus ENOPLOLINDENIUS Rohwer**

The genus occurs only in the New World. Nothing is known of the biology, but morphological characters of the female suggest that these are ground-nesting species.

Revision: Pate, 1942. *Rev. de Ent.* 13: 386-421 (New World spp.).

**Genus ENOPLOLINDENIUS Subgenus ISKUTANA Pate**

*Enoplolindenius* subg. *Iskutana* Pate, 1942. *Rev. de Ent.* 13: 390.

Type-species: *Enoplolindenius (Iskutana) georgia* Pate. Orig. desig.

**robertsoni** (Rohwer). Ga., La., Tex., Kans., Nebr., Iowa, Ill.

*Lindenius robertsoni* Rohwer, 1920. *Ent. Soc. Wash.*, Proc. 22: 57. ♂.

*Enoplolindenius (Iskutana) georgia* Pate, 1942. *Rev. de Ent.* 13: 393. ♂.

*Enoplolindenius (Iskutana) ponca* Pate, 1942. *Rev. de Ent.* 13: 395. ♀.

**Genus ENOPLOLINDENIUS Subgenus ENOPLOLINDENIUS Rohwer**

*Lindenius* subg. *Enoplolindenius* Rohwer, 1911. *U. S. Natl. Mus.*, Proc. 40: 562.

Type-species: *Lindenius (Enoplolindenius) clypeatus* Rohwer. Orig. desig.

**clypeatus** (Rohwer). Tex. (Brownsville).

*Lindenius (Enoplolindenius) clypeatus* Rohwer, 1911. *U. S. Natl. Mus.*, Proc. 40: 562. ♂.

**Genus ECTEMNIUS Dahlbom**

In the North American fauna a number of species nest in the soft pith of living or dead stems or twigs; the nests of these species consist usually of a linear series of cells separated from each other by partitions of pith particles. Other species make burrows in decaying wood. None of our species has been reported as nesting in the ground, as do members of several extralimital subgenera, but morphological characters of the females suggest that members of the subgenus *Protothyreopus* nest in the ground.

**Genus ECTEMNIUS Subgenus PROTOTHYREOPUS Ashmead**

*Protothyreopus* Ashmead, 1899. *Canad. Ent.* 31: 170.

Type-species: *Crabro rufifemur* Packard. Orig. desig.

Nothing is known of the biology of this subgenus, but the species probably nest in the ground.

**dilectus** (Cresson). Transit. and U. Austr. Zones in most of U. S. except west of Sierra Nevada and Cascade ranges.

*Crabro dilectus* Cresson, 1865. *Ent. Soc. Phila.*, Proc. 4: 478. ♀, ♂.

*Crabro bigeminus* Patton, 1879. *Canad. Ent.* 11: 213. ♀, ♂.

*Crabro (Protothyreopus) megacephalus* Rohwer, 1908. *Ent. News* 19: 249. ♀. Preocc.

*Crabro (Protothyreopus) dilectiformis* Rohwer, 1909. *Ent. News* 20: 146. ♀.

*Crabro (Protothyreopus) crassiceps* Mickel, 1916. *Amer. Ent. Soc.*, Trans. 42: 425. ♀.

Taxonomy: Pate, 1946. *Notulae Nat.* 171: 2 (synonymy).

**rufifemur rufifemur** (Packard). Transit. and U. Austr. Zones east of Rockies. Another subsp. occurs in Mexico.

*Crabro rufifemur* Packard, 1866. *Ent. Soc. Phila.*, Proc. 6: 81. ♀, ♂.

**Genus ECTEMNIUS Subgenus CLYTOCHRYSPUS Morawitz**

*Crabro* subg. *Clytochryspus* Morawitz, 1864. *Acad. Imp. Sci. St. Petersburg*, Bul. 7: 453.

Type-species: *Crabro chrysostomus* Lepeletier and Brulle. Desig. by Richards, 1935.

Several species of this subgenus are known to nest in decaying wood of logs or stumps. The burrows may have a number of branches each ending in one or two cells.

**lapidarius** (Panzer). U. S. and Canada, transcont. in Canada, Transit. and U. Austr. Zones;

Palaeartic also. Ecology: Nests in rotting stumps or logs, stores 2-16 prey per cell, makes 1-2 cells at end of each branch of the burrow and as many as 16 cells per nest.



Prey: *Syrpitta pipiens* (L.), *Chrysogaster* sp., *Toxomerus occidentalis* Curr., *Sphaerophoria contigua* Macq., *Mesograpta marginata* (Say), *Parapenium* sp., *Paragus tibialis* (Fall.); Syrphidae seem to be the preferred prey, but occasionally Anthomyiidae are used in Europe.

*Crabro lapidarius* Panzer, 1804. Faunae Ins. German., heft 90, pl. 12. ♂.

*Crabro sinuatus* Fabricius, 1804. Systema Piezatorum, p. 310.

*Crabro cinctus* Spinola, 1806. Insectorum Liguria, v. 1, p. 104. ♀, ♂. This is a questionable synonym.

*Crabro chrysostomus* Lepeletier and Brulle, 1834. Soc. Ent. France, Ann. 3: 704. ♀. Preocc.

*Crabro comptus* Lepeletier and Brulle, 1834. Soc. Ent. France, Ann. 3: 705. ♂.

*Crabro xylurgus* Shuckard, 1837. Essay on Indig. Fossor. Hym., p. 139. ♀, ♂.

*Crabro interstinctus* Smith, 1851. Zoologist 9: cxxvi. ♂.

*Crabro obscurus* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 418. ♀, ♂.

*Crabro gracilissimus* Packard, 1866. Ent. Soc. Phila., Proc. 6: 78. ♂.

*Crabro denticulatus* Packard, 1866. Ent. Soc. Phila., Proc. 6: 97. ♂.

*Crabro effossus* Packard, 1866. Ent. Soc. Phila., Proc. 6: 104. ♂.

*Crabro papagorum* Viereck, 1908. Amer. Ent. Soc., Trans. 33: 401. ♀.

Taxonomy: Pate, 1946. Notulae Nat. 171: 2-3 (synonymy).

Biology: Michener, 1971. Kans. Ent. Soc., Jour. 44: 405-407, 1 fig. (nest, prey).

**ruficornis** *ruficornis* (Zetterstedt). Canada and U. S., transcot. chiefly in Transit. Zone; Mexico (Guerrero); also Palaearctic. Prey: *Syrphus ribesii* (L.) in N. Amer. Another subsp. occurs in Taiwan.

*Crabro ruficornis* Zetterstedt, 1838. Ins. Lappon. 1: 443. ♂.

*Crabro aurilabris* Herrich-Schaeffer, 1841. Faunae Ins. German., h. 179, p. 12. ♂.

*Crabro nigrifrons* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 482. ♂.

*Crabro contiguus* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 484. ♀.

*Crabro septentrionalis* Packard, 1866. Ent. Soc. Phila., Proc. 6: 110. ♀.

*Crabro (Solenius) planifrons* Thomson, 1870. Opusc. Ent., v. 2, p. 173. ♀, ♂.

*Crabro hector* Cameron, 1891. Biol. Cent.-Amer., Hym., v. 2, p. 147, pl. 9, fig. 8. ♀.

*Crabro (Clytochrysus) longipalpis* Verhoeff, 1892. Ent. Nachr. 18: 70. ♀.

*Crabro vestor* Ashmead, 1899. Canad. Ent. 31: 173. Lapsus for *hector* Cam.

*Crabro chopanii* Matsumura, 1911. Hokkaido Imp. Univ., Faculty Agr., Jour. 4: 102. ♀.

*Crabro lineatofarsis* Matsumura, 1911. Hokkaido Imp. Univ., Faculty Agr., Jour. 4: 103. ♀.

Taxonomy: Pate, 1946. Notulae Nat. 171: 2 (synonymy).

Biology: Krombein, 1936. Ent. News 47: 95 (prey).

**yosemite** Pate, Calif. (Mariposa Co.).

*Ectemnius (Clytochrysus) yosemite* Pate, 1946. Notulae Nat. 171: 3. ♀.

#### Genus ECTEMNIUS Subgenus METACRABRO Ashmead

*Metacrabro* Ashmead, 1899. Canad. Ent. 31: 169.

Type-species: *Crabro Kollari* Dahlbom. Orig. desig.

*Solenius* subg. *Lophocrabro* Rohwer, 1917 (1916). Conn. State Geol. and Nat. Hist. Survey, Bul. 22: 667.

Type-species: *Crabro singularis* Smith. Orig. desig.

In Europe *cephalotes* (Oliv.) has been reported to nest in both sound lumber and in decaying trunks.

**cephalotes** (Olivier). Ont., Que., Conn., N. Y., N. J., Pa., Md., Ill.; Europe. Ecology: In Europe nests both in sound lumber and in decaying logs; several females use a common entrance but presumably have their own cells. Probably adventive in N. Amer. Prey: In Europe stores many species of muscoid Diptera, occasionally Tabanidae and Syrphidae, and one specimen of Nematinae was found in a cell.

*Crabro tibialis* Olivier, 1792. Encycl. Meth. Ins., v. 6, p. 513.

*Crabro cephalotes* Olivier, 1792. Encycl. Meth. Ins., v. 6, p. 513.

*Crabro floralis* Olivier, 1792. Encycl. Meth. Ins., v. 6, p. 517.

*Crabro geniculatus* Olivier, 1792. Encycl. Meth. Ins., v. 6, p. 517.

*Crabro cephalotes* Panzer, 1799. Faunae Ins. German., h. 6, pl. 62, fig. 16. Preocc. This is a questionable synonym.

*Crabro striatus* Lepeletier and Brulle, 1834. Soc. Ent. France, Ann. 3: 707. ♀, ♂.

*Crabro ornatus* Lepeletier and Brulle, 1834. Soc. Ent. France, Ann. 3: 709. ♀.

*Blepharipus striatulus* Lepeletier and Brulle, 1834. Soc. Ent. France, Ann. 3: 737. ♂.

*Ceratocolus striatus* Lepeletier and Brulle, 1834. Soc. Ent. France, Ann. 3: 744. ♂. Preocc.

*Crabro Lindenius* Shuckard, 1837. Essay on Indig. Fossor. Hym., p. 143. ♀, ♂.

*Crabro Shuckardi* Dahlbom, 1838. Exam. Crabron. Scand., p. 98. ♀, ♂.

*Crabro interruptus* Dahlbom, 1845. Hym. Europaea, v. 1, p. 418. ♀, ♂. N. name for *Shuckardi*.

*Crabro Fargeii* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 410. N. name for *Ceratocolus striatus*.

*Crabro Lindensis* Inehbald, 1859. Ent. Weekly Intelligencer 6: 199. Lapsus.

*Crabro aciculatus* Provancher, 1882. Nat. Canad. 13: 108. ♀, ♂.

*Crabro (Solenius) ruthenicus* Morawitz, 1892. Soc. Ent. Rossica, Horae 26: 174. ♀.

*Crabro Lindenii* Dalla Torre, 1897. Cat. Hym., v. 8, p. 621. Lapsus for *lindensis* Inehb.

Taxonomy: Pate, 1945. Brooklyn Ent. Soc., Bul. 40: 41-43 (synonymy). —van der Vecht, 1961. Zool. Verhandl. Rijksmus. Natuurlijke Hist. Leiden, No. 48, pp. 70-71 (identity of *cephalotes* Oliv.).

Biology: Hamm and Richards, 1926. Ent. Soc. London, Trans., pp. 306-307, 321-322 (nest, prey in Europe; misdet. as *quadricinctus* F.).

*maculosus* (Gmelin). Canada and U. S. in Transit. Zone east of 100th meridian. Parasite:

*Crabrovidia ectemni* Fain. Prey: *Tubifera arbutorum* (L.).

*Crabro maculatus* Fabricius, 1781. Spec. Ins., v. 1, p. 470. Secondary homonym in *Vespa*.

*Vespa (Crabro) maculosa* Gmelin, 1790. In Linnaeus, Syst. Nat., Ed. 13, v. 1, p. 2761. N. name.

*Crabro singularis* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 417. ♂.

*Crabro frigidus* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 419. ♀.

*Crabro quadrangularis* Packard, 1866. Ent. Soc. Phila., Proc. 6: 85. ♀.

*Crabro 14-maculatus* Packard, 1866. Ent. Soc. Phila., Proc. 6: 87. ♂.

*Crabro oblongus* Packard, 1866. Ent. Soc. Phila., Proc. 6: 88. ♀.

*Crabro trapezoides* Packard, 1866. Ent. Soc. Phila., Proc. 6: 89. ♂.

*Crabro quadrangulus* Cresson, 1928. Amer. Ent. Soc., Mem. 5: 55. Lapsus.

Biology: Krombein, 1951. U. S. Dept. Agr., Monog. 2: 1025 (prey).

### Genus ECTEMNIUS Subgenus HYPOCRABRO Ashmead

*Hypocrabro* Ashmead, 1899. Canad. Ent. 31: 168.

Type-species: *Crabro 10-maculatus* Say. Orig. desig.

*Pseudocrabro* Ashmead, 1899. Canad. Ent. 31: 169.

Type-species: *Crabro chrysarginus* of Lepeletier. Orig. desig.

*Xestocrabro* Ashmead, 1899. Canad. Ent. 31: 169.

Type-species: *Crabro 6-maculatus* Say. Orig. desig.

*Xylocrabro* Ashmead, 1899. Canad. Ent. 31: 169.

Type-species: *Crabro stirpicola* Packard. Orig. desig.

*Ectemnius* subg. *Apoctemnius* Leclercq, 1950. Rev. Franc. d'Ent. 17: 200.

Type-species: *Ectemnius (Apoctemnius) domingensis* Leclercq. Orig. desig.

Some of our species nest in the soft pith of living or dead stems or twigs and make a linear series of cells separated by partitions of pith particles. Other species nest in decaying trunks, stumps or limbs.

*alpheus* Pate. Calif., Wash., Utah.

*Ectemnius (Hypocrabro) alpheus* Pate, 1946. Notulae Nat. 171: 5. ♀, ♂.

*arcuatus* (Say). Transcont. in Transit. and Austr. Zones. Ecology: Nests in logs. Prey: *Musca domestica* L.

*Crabro arcuatus* Say, 1837. Boston Jour. Nat. Hist. 1: 377. ♀.

*Crabro Packardii* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 477. ♀, ♂.

*Crabro honestus* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 485. "♀" = ♂.

*Crabro villosifrons* Packard, 1866. Ent. Soc. Phila., Proc. 6: 84. ♀.

*Crabro* (subgenus?) *nokomis* Rohwer, 1908. Ent. News 19: 251. ♀.

*Solenius* (*Hypocrabro*) *nokonis* (!) Rohwer, 1917. U. S. Natl. Mus., Proc. 53: 242.

Taxonomy: Pate, 1946. Notulae Nat. 171: 9-10 (synonymy).

Biology: Rau and Rau, 1918. Wasp studies afield, pp. 94, 96 (nest, prey).

*besseyae* (Rohwer). Calif., Colo., Utah, N. Mex.

*Crabro* (*Xylocrabro*?) *besseyae* Rohwer, 1908. Ent. News 19: 419. ♀.

*centralis* (Cameron). Tex., N. Mex., Ariz.; Mexico south to Colombia and Trinidad.

*Crabro centralis* Cameron, 1891. Biol. Cent.-Amer., Hym., v. 2, p. 146. ♀.

*continuus continuus* (Fabricius). Canada and U. S., transect. in Canad., Transit. and U.

Austr. Zones; Palaearctic Region. Ecology: Nests in borings in tree root or rotten branch. Parasite: *Macronychia aurata* (Coq.). Prey: *Archytas aterrimus* (Desv.), *Winthemia* sp., Tachinidae sp.; *Sarcophaga* sp., Sarcophagidae sp.; *Pollenia rudis* (F.), *Phaenicia* ? sp., Calliphoridae sp.; Muscidae sp.; in Europe muscid Diptera are also the preferred prey but Syrphidae are used occasionally. Another subsp. occurs in the Canary Islands.

*Crabro continuus* Fabricius, 1804. Systema Piezatorum, p. 312.

*Crabro 6-maculatus* Say, 1824. In Keating, Narr. Long's 2nd Exped., v. 2, p. 341. ♀.

Preoce.

*Solenius punctatus* Lepeletier and Brulle, 1834. Soc. Ent. France, Ann. 3: 720. ♂.

*Ceratocolus punctatus* Lepeletier and Brulle, 1834. Soc. Ent. France, Ann. 3: 749. ♀, ♂.

Preoce.

*Crabro fuscitarsis* Herrich-Schaeffer, 1841. Fauna Ins. German., h. 181, pl. 7. ♀.

*Crabro impressus* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 401. N. name for *Ceratocolus punctatus* Lep. and Br.

*Crabro sulphureipes* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 415. ♂.

*Crabro* (*Ectemnius*) *fuscitarsis* Schenck, 1857. Nassau. Ver. f. Naturk., Jahrb. 12: 70.

Lapsus.

*Crabro vagatus* Smith, 1869. Entomologist 4: 208. ♀.

*Crabro granulatus* Walker, 1871. List Hym. Egypt, p. 26. ♂.

*Crabro rugoso-punctatus* Taschenberg, 1875. Ztschr. f. Naturw. 45: 385. ♂.

*Crabro validus* De Stefani, 1884. Nat. Sicil., v. 3, p. 218. ♂.

*Crabro vagans* Fokker, 1887. Tijdschr. v. Ent. 30: xx. Lapsus.

*Xylocrabro slossonae* Ashmead, 1902. Ent. News 13: 5. ♂. Nom. nud.

*Crabro sayi* Cockerell, 1910. Entomologist 43: 61. N. name for *Crabro sexmaculatus* Say.

*Crabro bisexmaculatus* Viereck, 1910 (1909). In Smith, N. J. State Mus. Ann. Rpt. 1909, p. 681. N. name for *Crabro sexmaculatus* Say.

*Crabro hispanicus* Kohl, 1915. K. K. Naturhist. Hofmus. Wien, Ann. 29: 81. ♀.

*Solenius* (*Hypocrabro*) *giffardi* Rohwer, 1917. U. S. Natl. Mus., Proc. 53: 242. ♀, ♂.

Taxonomy: Pate, 1946. Notulae Nat. 171: 10 (synonymy). — Evans, 1964. Amer. Ent. Soc., Trans. 90: 295, fig. 114 (larva).

Biology: Peckham and Peckham, 1905. Wasps Social and Solitary, pp. 97-101, 1 fig. (nest, prey). — Reinhard, 1929. The Witchery of Wasps, pp. 228-231, 4 figs. (nest, prey, parasite). — Krombein, 1961. Brooklyn Ent. Soc., Bul. 56: 65 (prey). — Krombein, 1964. Brooklyn Ent. Soc., Bul. 58: 120 (nest, prey, cocoon, life cycle). There is also an extensive European literature.

*decemmaculatus decemmaculatus* (Say). U. and L. Austr. Zones east of Rocky Mts.; Mexico.

*Crabro 10-maculatus* Say, 1823. West. Quart. Rptr., v. 2, p. 78.

*Crabro chrysargyrus* Lepeletier and Brulle, 1834. Soc. Ent. France, Ann. 3: 711. ♀.

*Crabro chrysarginus* Lepeletier, 1845. Hist. Nat. Ins. Hym., v. 3, p. 114. Lapsus.

*Crabro chrysargurus* Dahlbom, 1845. Hym. Europaea, v. 1, p. 386. Lapsus.

*Crabro collinus* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 420. ♂.

*Crabro aurifrons* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 420. ♀.

*Crabro* (*Hoplocrabro*) *novanus* Rohwer, 1911. U. S. Natl. Mus., Proc. 40: 564. ♀, ♂.

Taxonomy: Pate, 1946. Notulae Nat. 171: 8 (synonymy).

**decemmaculatus tequesta** Pate. Cent. and south. Fla.

*Ectemnius (Hypocrabro) 10-maculatus tequesta* Pate, 1946. Notulae Nat. 171: 9. ♀, ♂.

**excavatus banksi** (Rohwer). Md. to Ga., Ind., Kans., Mo., Tex. south to Mexico (Yucatan).

Ecology: Nests in rotten log.

*Crabro banksi* Rohwer, 1909. Ent. News 20: 147. ♀.

*Ectemnius (Hypocrabro) ravinus* Leclercq, 1968. Soc. Ent. France, Ann. (n. s.) 4 (2): 325. ♀.

Biology: Krombein, 1951. U. S. Dept. Agr., Monog. 2: 1026 (nest).

**excavatus excavatus** (Fox). Fla.

*Crabro excavatus* Fox, 1892. Ent. News 3: 10. ♀, ♂ (in part misdet.).

**odyneroides** (Cresson). Colo., N. Mex., Ariz.; Mexico (Guerrero, Durango).

*Crabro odyneroides* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 481. ♂.

*Crabro ariel* Cameron, 1891. Biol. Cent.-Amer., Hym., v. 2, p. 147, pl. 9, fig. 7, a, b. ♀, ♂.

**paucimaculatus** (Packard). N. Y. to Fla., Ill., Tex. Ecology: Nests in green *Hibiscus* stems along river bank, chewing through side of stem to reach central pith cavity, makes linear series of 1-18 cells, stores 7-31 prey per cell. Parasite: *Vidia cooremani* Baker; *Megaselia aletiae* (Comst.); *Eustalomyia vittipes* (Zett.); *Macronychia aurata* (Coq.), *Ptychoneura aristalis* (Coq.); *Tetrabaesus americanus* (Brues), *Perilampus canadensis* Cwfd.; *Diomorus zabriskiei* Cr. Prey: *Dolichopus ovatus* Lw., *D. sp.*; *Melanagromyza diantherae* (Mall.), *Agromyzidae* sp.; *Notiphila carinata* Lw., *N. erythrocerata* Lw., *N. sp.*, *Hydrellia* spp., *Scatella picea* (Wlkr.); *Eumetopiella rufipes* (Macq.), *Chaetopsis* sp., *Otitidae* sp.; *Camptoprosopella angulata* Shew.; *Lonchaea polita* Say; *Sepedon armipes* Lw., *S. sp.*, *Dictya texensis* Curr.; *Leptocera richardsi* Sabr.; *Coenosia atrata* Wlkr., *Lispe albitarsis* Stein; preferred prey are *Agromyzidae* and *Ephydriidae*. The common name is the hibiscus wasp.

*Crabro paucimaculatus* Packard, 1866. Ent. Soc. Phila., Proc. 6: 90. ♀.

Taxonomy: Evans, 1964. Amer. Ent. Soc., Trans. 90: 294-295, fig. 113 (larva).

Biology: Krombein, 1951. U. S. Dept. Agr., Monog. 2: 1026 (nest). —Krombein, 1964. Biol.

Soc. Wash., Proc. 77: 73-88, figs. 1-11 (nest, prey, egg, cocoon, life cycle, parasites).

**rufipes ais** Pate. Fla. Ecology: Nests in rose canes, makes linear series of up to 3 cells per nest, stores 20-30 prey per cell. Prey: *Euxesta nitidiventris* Lw.; *Acitura insecta* Lw., *Paroxyna sorocula* (Wied.); *Chloropidae* spp.; *Otitidae* and *Trypetidae* are the preferred prey.

*Ectemnius (Hypocrabro) texanus ais* Pate, 1946. Notulae Nat. 171: 12. ♀, ♂.

Biology: Morse and Kerr, 1957. Fla. Ent. 40: 77-80, 1 fig. (nest, prey).

**rufipes rufipes** (Lepeletier and Brulle). N. Y. to north. Fla., west to Iowa, Kans. and Tex.

Ecology: Nests in twigs.

*Ceratocolus rufipes* Lepeletier and Brulle, 1834. Soc. Ent. France, Ann. 3: 741. ♀.

*Crabro texanus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 227. ♀.

**satan** Pate. N. Mex. to Calif.

*Ectemnius (Hypocrabro) satan* Pate, 1946. Notulae Nat. 171: 10. ♂.

**scaber rufescens** Krombein. Cent. and south Fla.

*Ectemnius (Hypocrabro) scaber rufescens* Krombein, 1954. Amer. Ent. Soc., Trans. 80: 24. ♂, ♀.

**scaber scaber** (Lepeletier and Brulle). N. J. to Fla., La., Tex., Okla. Ecology: Nests in pine.

*Solenius scaber* Lepeletier and Brulle, 1834. Soc. Ent. France, Ann. 3: 715. ♂.

**sonorensis** (Cameron). Colo., N. Mex., Ariz., south. Calif.; Mexico (Baja California, Sonora, Guerrero).

*Crabro sonorensis* Cameron, 1891. Biol. Cent.-Amer., Hym., v. 2, p. 144, pl. 9, fig. 4. ♀.

*Crabro montivagus* Cameron, 1891. Biol. Cent.-Amer., Hym., v. 2, p. 145, pl. 9, figs. 5, a, b. ♀, ♂.

*Crabro imbutus* Fox, 1894. Calif. Acad. Sci., Proc. (2) 4: 108. ♀.

*Crabro (Solenius ?) ferrugineipes* Rohwer, 1908. Ent. News 19: 250. ♂.

- spiniferus** (Fox). Colo., Nev., Ariz., Calif. to Wash. Ecology: Nests in stems of *Sambucus*, *Foeniculum* and *Eriogonum*, makes linear series of 1-6 cells per nest, stores 2-10 prey per cell. Parasite: *Senotainia trilineata* (Wulp), *Macronychia* sp., *Amobia floridensis* (Tns.); *Megaselia* sp.; *Diomorus zabriskiei* Cr.; *Monodontomerus* sp. Prey: *Sphaerophoria* sp.; *Ogcodes eugonatus* Lw.; *Hylemya* sp.; preferred prey are Acroceridae. Predator: *Cymatodera ovipennis* LeC.
- Crabro spiniferus* Fox, 1895. Amer. Ent. Soc., Trans. 22: 148. ♂, ♀.
- Solenius* (*Pseudocrabro*) *conspiciendus* Mickel, 1918 (1917). Nebr. Univ. Studies 17: 324. ♀, ♂.

Biology: Bechtel and Schlinger, 1957. Ent. News 68: 225-232 (nest, prey, parasites, predator). — Parker and Bohart, 1966. Pan-Pacific Ent. 42: 94 (nest, parasites).

- stirpicola** (Packard). Canada and U. S. in Transit. and U. Austr. Zones east of 100th meridian. Ecology: Nests in pith in twigs of *Ailanthus*, blackberry, sumac, *Sambucus*, and in old railroad tie, stores 6-27 prey per cell. Parasite: *Diomorus zabriskiei* Cr.; *Habritys latro* Wall.; *Perilampus canadensis* Cwfd.; *Amobia* sp. Prey: *Simulium jenningsi* Mall.; *Solva pallipes* (Lw.); *Orycera maculata* Oliv.; *Condylostylus sipho* (Say), *C. sp.*, *Asyndetus* sp.; *Mesograpta marginata* (Say); *Euxesta notata* (Wied.); *Amphicnephes pullus* (Wied.); *Rivellia pallida* Lw., *R. steyskali* Namba; *Euaresta bella* (Lw.); *Lonchaea polita* Say ?, *L. sp.*; *Lyciella pictiventris* (Mall.), *Sapromyza umbrosa* Lw.; *Agromyza parvicornis* Lw., *A. sp.*, *Melanagromyza burgessi* (Mall.), *M. virens* (Lw.), *M. sp.*; *Chyromyza* sp.; *Cordilura fuscipes* Zett., *Phorbia* sp., *Anthomyia* sp.; *Coenosia* sp. near *antennalis* Stein; *Phormia regina* (Meig.), *Lucilia* sp., *Calliphora vomitoria* (L.); *Ravinia derelicta* (Wlkr.), *Sarcodexia* sp.; *Hyalomyodes triangulifer* (Lw.), *Cryptomeigenia eumythyroides* (Tns.), *Paradidyma singularis* (Tns.), *Sitophaga calosomoides* (Tns.), *Lespesia* sp., *Elfia johnsoni* (Coq.), Tachinidae sp.; although *stirpicola* preys upon a wide range of Diptera, the preferred prey are clearly acalyptate and calyptate Cyclorrhapha.
- Crabro stirpicola* Packard, 1866. Ent. Soc. Phila., Proc. 6: 111. ♀, ♂.

Taxonomy: Evans, 1957. Amer. Ent. Soc., Trans. 83: 109, figs. 85-90 (larva). — Evans, 1959. Amer. Ent. Soc., Trans. 85: 165 (larva).

Biology: Packard, 1869. Guide Study Ins., p. 158 (nest). — Cresson, 1878. Psyche 2: 189 (nest, parasite). — Peckham and Peckham, 1898. Wis. Geol. Nat. Hist. Survey, Bul. 2: 46-52, pl. 1, fig. 5, pl. 11, figs. 6, 7 (nest, prey, cocoon, life cycle). — Rau and Rau, 1918. Wasp Studies Afield, pp. 90-94, figs. 21, 22 (nest, prey, life cycle). — Rau, 1922. Acad. Sci. St. Louis, Trans. 24: 20-21 (nest, prey, life cycle, parasite). — Rau, 1928. Acad. Sci. St. Louis, Trans. 25: 381-387, fig. 50 (nest, prey, life cycle). — Krombein, 1960. Ent. News 71: 63-68 (nest, prey, egg, life cycle, cocoon, parasites).

- trifasciatus** (Say). Chiefly Transit. Zone of Canada and U. S. east of Cascade and Sierra Nevada ranges.

*Crabro trifasciatus* Say, 1824. In Keating, Narr. Long's 2nd Exped., v. 2, p. 342.

#### Genus ECTEMNIUS Subgenus ECTEMNIUS Dahlbom

*Crabro* subg. *Ectemnius* Dahlbom, 1845. Hym. Europaea, v. 1, p. 389.

Type-species: *Crabro guttatus* of Dahlbom. Desig. by Ashmead, 1899.

*Crabro* subg. *Mesocrabro* Verhoeff, 1892. Ent. Nachr. 18: 70.

Type-species: *Crabro guttatus* Vander Linden. Desig. by Pate, 1937.

- atriceps** (Cresson). South. Canada and U. S., chiefly in Transit. Zone. Ecology: Nests in logs.

*Crabro atriceps* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 483. ♀.

*Crabro brunneipes* Packard, 1866. Ent. Soc. Phila., Proc. 6: 102. ♂.

*Crabro foxii* Kincaid, 1900. Ent. News 11: 356. ♂.

Taxonomy: Pate, 1946. Notulae Nat. 171: 14 (synonymy). — Evans, 1957. Amer. Ent. Soc., Trans. 83: 109, figs. 91-94 (larva).

- corrugatus** (Packard). Canad. and Transit. Zones in Alaska, Canada, U. S.

*Crabro pauper* Packard, 1866. Ent. Soc. Phila., Proc. 6: 95. ♂.

*Crabro corrugatus* Packard, 1866. Ent. Soc. Phila., Proc. 6: 107. ♀.

*Crabro* (*Cuphopterus*) *operus* Rohwer, 1908. Ent. News 19: 247. ♀.

*Crabro* (*Xestocrabro*) *drymocalidis* Rohwer, 1908. Ent. News 19: 255. ♂.

Taxonomy: Pate, 1946. Notulae Nat. 171: 14 (synonymy).

*dives* (Lepeletier and Brulle). Transcont. in Canad. and Transit. Zones of Canada and U. S.; also Palaearctic. Ecology: Nests in log in U. S., in Europe in decayed or rotten logs, and soft pith of canes and stems. Prey: Syrphidae and Tachinidae in Europe. Predator: *Philanthus pulcher* D. T.

*Solenius dives* Lepeletier and Brulle, 1834. Soc. Ent. France, Ann. 3: 716. ♀, ♂.

*Solenius octonotatus* Lepeletier and Brulle, 1834. Soc. Ent. France, Ann. 3: 719. ♂.

*Solenius alatus* Dahlbom, 1838. Exam. Crabron. Scand., p. 85. ♀, ♂.

*Crabro pictipes* Herrich-Schaeffer, 1841. Faunae Ins. German., h. 181: pl. 5.

*Solenius octavonotatus* Lepeletier, 1845. Hist. Nat. Ins. Hym., p. 125. Emend.

*Crabro auratus* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 398. N. name for *dives*.

*Crabro montanus* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 484. ♀. Preocc.

*Crabro cristatus* Packard, 1866. Ent. Soc. Phila., Proc. 6: 101. ♂.

*Crabro cubiceps* Packard, 1866. Ent. Soc. Phila., Proc. 6: 105. ♀.

*Crabro* (*Xestocrabro*) *heraclei* Rohwer, 1908. Ent. News 19: 253. ♂.

*Crabro montivagans* Strand, 1917. Archiv f. Naturgesch. 82: 98. N. name for *montanus*.

Taxonomy: Pate, 1945. Brooklyn Ent. Soc., Bul. 40: 38-40 (synonymy). — Pate, 1946. Notulae Nat. 171: 14 (synonymy).

Biology: Barth, 1907. Wis. Nat. Hist. Soc., Bul. 5: 251 (nest). — Richards, 1944. Roy. Ent. Soc. London, Proc., ser. A, 9: 134 (nest, prey in Europe). — Pate, 1945. Brooklyn Ent. Soc., Bul. 40: 40 (refs. to European lit.).

*proletarius* (Mickel). Colo., N. Dak.

*Crabro parvulus* Packard, 1866. Ent. Soc. Phila., Proc. 6: 108. ♀. Preocc.

*Crabro* (*Xestocrabro*) *proletarius* Mickel, 1916. Amer. Ent. Soc., Trans. 42: 426. ♂.

### Genus LESTICA Billberg

So far as known all species in this genus prey upon adult Lepidoptera, usually Microlepidoptera or small Noctuidae, but butterflies may be used occasionally.

Taxonomy: Pate, 1947. Notulae Nat. 185: 13 (key to subg.).

### Genus LESTICA Subgenus LESTICA Billberg

*Lestica* Billberg, 1820. Enum. Ins., p. 107.

Type-species: *Crabro subterraneus* Fabricius. Desig. by Rohwer, 1911.

*Hypothyreus* Ashmead, 1899. Canad. Ent. 31: 171.

Type-species: *Crabro subterraneus* Fabricius. Orig. desig.

The typical subgenus does not occur in North America. Members of this subgenus are ground-nesting species.

### Genus LESTICA Subgenus SOLENIUS Lepeletier and Brulle

*Solenius* Lepeletier and Brulle, 1834. Soc. Ent. France, Ann. 3: 713.

Type-species: *Solenius interruptus* Lepeletier and Brulle. Desig. by Internatl.

Conn. Zool. Nomencl., Op. 1015, 1974.

Members of this subgenus nest in decaying wood or in soft pith of plant stems.

Taxonomy: Court and Menke, 1968. Bul. Zool. Nomencl. 24: 357-358 (petition to set aside type-species designation of *Sphex vagus* Westwood, 1839, and to designate *Solenius interruptus* Lep. and Br. as type-species).

*cinctella* (Fox). Nev., Calif., Oreg.

*Crabro cinctellus* Fox, 1895. Amer. Ent. Soc., Trans. 22: 136. ♀.

Taxonomy: Leclercq, 1951, Soc. Ent. Belg., Bul. et Ann. 87: 171. ♂.

- confluenta** (Say). South. Canada and U. S. in Transit. and Austr. Zones; Mexico (Chihuahua).  
 Ecology: Nests in decaying logs, in borings in wooden posts and in pith of catalpa stem, stores 6 prey per cell. Prey: Adults of moth spp.  
*Solenius interruptus* Lepeletier and Brulle, 1834. Soc. Ent. France, Ann. 3: 716. ♀. Preocc. in *Crabro*.  
*Crabro confluentus* Say, 1837. Boston Jour. Nat. Hist. 1: 376. ♀, ♂.  
*Crabro dubius* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 417. N. name.  
*Crabro confluentus* Leconte, 1859. Ent. of N. Amer. (Thos. Say), p. 758. Lapsus.  
*Crabro bellus* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 481. ♀.  
*Crabro atrifrons* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 483. ♂.  
*Crabro eburneus* Taschenberg, 1875. Ztschr. Gesam. Naturw. Halle 45: 383. ♂.  
*Crabro cinctibellus* Viereck, 1908. Amer. Ent. Soc., Trans. 33: 401. ♀, ♂.  
*Crabro opwana* Rohwer, 1908. Ent. News 19: 248. ♂.  
*Crabro (Solenius) townsendi* Rohwer, 1911. U. S. Natl. Mus., Proc. 40: 563. ♀.  
*Crabro (Solenius) planaris* Mickel, 1916. Amer. Ent. Soc., Trans. 42: 427. ♂.  
*Solenius seamansi* Carter, 1925. Canad. Ent. 57: 135. ♂.

Taxonomy: Pate, 1947. Notulae Nat. 185: 13-14 (synonymy).

Biology: Peckham and Peckham, 1905. Wasps, Social and Solitary, pp. 102-105, 1 fig. (nest, prey). — Rau, 1922. St. Louis Acad. Sci., Trans. 24: 19-20 (nest). — Rau, 1928. Acad. Sci. St. Louis, Trans. 25: 378 (nest, cocoon, life cycle).

Morphology: Snodgrass, 1941. Smithsn. Inst., Misc. Collect. 99 (14): pl. 20, figs. O, R (male genitalia).

- producticollis** (Packard). Transcont. in Canada and U. S. in Transit. and U. Austr. Zones.  
*Crabro producticollis* Packard, 1866. Ent. Soc. Phila., Proc. 6: 76. ♂.  
*Crabro 4-maculatus* Provancher, 1882. Nat. Canad. 12: 102. ♀. Typ. err. ? Preocc.  
*Crabro 4-punctatus* Provancher, 1883. Faune Ent. Canad., Hym., p. 653. ♂. Preocc.

#### NOMINA NUDA IN CRABRONINAE

**glauconotatus** Harris. Mass.

*Crabro glauconotatus* Harris, 1835. In Hitchcock, Rpt. Geol., Mineral., Bot., Zool., Mass., p. 588.

### Family MELLINIDAE

This small family contains only two subfamilies, Xenosphecinae and Mellininae, which appear to be more closely related to one another than either is to any other family of Sphecoidea. The former subfamily is known only from the southwestern deserts of North America. The latter is Holarctic and Neotropical in distribution. Both subfamilies nest in the ground and prey upon Diptera.

#### SUBFAMILY XENOSPHECINAE

##### Genus XENOSPHEX Williams

*Xenosphex* Williams, 1954. Wasmann Jour. Biol. 12: 97.

Type-species: *Xenosphex xerophila* Williams. Orig. desig.

Revision: Parker, 1966. Pan-Pacific Ent. 42: 190-195, 8 figs.

**boharti** Parker. Calif. (Inyo Co.).

*Xenosphex boharti* Parker, 1966. Pan-Pacific Ent. 42: 191, figs. 1, 2, 6, 7. ♂, ♀.

**timberlakei** Williams. Southeast. Calif., northwest. Ariz., south. Nev. Ecology: Nests in sand.

Prey: *Lordotus miscellus* Coq.

*Xenosphex timberlakei* Williams, 1955. Wasmann Jour. Biol. 13: 313. ♀.

Biology: Parker, 1966. Pan-Pacific Ent. 42: 194-195 (nest, prey transport).

**xerophilus** Williams. South. Calif. and Nev., northwest. and south. Ariz.

*Xenosphex xerophila* Williams, 1954. Wasmann Jour. Biol. 12: 99, figs. 1-6. ♂ (♀ misdet.).

Taxonomy: Williams, 1955. Wasmann Jour. Biol. 13: 313. ♀.

## SUBFAMILY MELLININAE

Taxonomy: Maidl and Klima, 1939. Hym. Cat., Pars 8, Sphecidae, v. 1, pp. 30-43 (world catalog). — Evans, 1959. Amer. Ent. Soc., Trans. 85: 145-147, figs. 23-30 (larva).

## Genus MELLINUS Fabricius

*Mellinus* Fabricius, 1790. Skrivt. Naturhist. Selsk., h. 1, p. 226.

Type-species: *Vespa arvensis* Linnaeus. Desig. by Curtis, 1836.

*Millinus* Gimmerthal, 1836. Soc. Imp. Nat. Moscow, Bul. 9: 449. Lapsus or emend.

Nothing is known of the biology of the North American species. The European *arvensis* (L.) nests gregariously in the ground, makes multicelled nests with each cell on a branch off the main burrow, preys primarily on muscoid Diptera and stores 4-9 flies per cell.

Revision: Fox, 1894. Ent. News 5: 201-203 (N. Amer. spp.).

Taxonomy: Siri and Bohart, 1974. Pan-Pacific Ent. 50: 169-176, 16 figs. (synopsis of world spp.).

**abdominalis** Cresson. Nebr., Colo., Wyo., Mont.

*Mellinus abdominalis* Cresson, 1882 (1881). Amer. Ent. Soc., Trans. 9: Proc., p. xxxix. ♀, ♂.

*Mellinus abdominalis* var. *personatus* Fox, 1894. Ent. News 5: 202. ♀.

**bimaculatus** Packard. Maine, N. H., Mass., N. Y., Pa., N. J., Ohio, Mich.; Mexico (Jalisco, Oaxaca).

*Mellinus bimaculatus* Harris, 1835. In Hitchcock, Rpt. Geol. Mineral. Bot. Zool. Mass., p. 68. Nom. nud.

*Mellinus bimaculatus* Packard, 1867. Ent. Soc. Phila., Proc. 6: 419. ♀.

*Mellinus wolcottii* Smith, 1908. Ent. News 19: 299. ♀.

**imperialis** Bohart. Calif. (Imperial Co.); Mexico (Sonora).

*Mellinus imperialis* Bohart, 1968. Pan-Pacific Ent. 44: 235, fig. 14. ♂, ♀.

**rufinodus** Cresson. Mont., Colo., S. Dak., Tex., N. Mex., Ariz., Utah; Mexico (Chihuahua, Durango, Guerrero, Mexico, Aguascalientes).

*Mellinus rufinodus* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 475. ♀, ♂.

## Family NYSSONIDAE

All members of this large cosmopolitan family nest in the ground. They are commonly called sand wasps.

Taxonomy: Rohwer, 1921. U. S. Natl. Mus., Proc. 59: 404 (key to tribes). — Pate, 1938. Amer. Ent. Soc., Trans. 64: 119-120 (key to tribes). — Evans and Lin, 1956. Amer. Ent. Soc., Trans. 82: 35-66, 13 pls. (larvae). — Evans, 1959. Amer. Ent. Soc., Trans. 85: 149-156, figs. 36-42, 60, 62, 63, 71-73 (larvae). — Evans, 1964. Amer. Ent. Soc., Trans. 90: 253-273, figs. 26-58 (larvae).

Biology: Evans, 1966. Compar. ethology and evolution of sand wasps, 526 pp., 215 figs., 47 tabs.

## SUBFAMILY ALYSSONINAE

Revision: Handlirsch, 1895. Akad. Wiss. Wien, Math.-Nat. Kl., Sitzber. 104: 830-839 (world spp.).

## Genus ALYSSON Panzer

*Alysson* Jurine, 1801. Intell. Blatt. Litt.-Ztg. Erlangen, v. 1, p. 164. Name suppressed by Internatl. Comn. Zool. Nomencl., Op. 135, 1939.

*Alysson* Panzer, 1806. Krit. Rev. Insektenf. Deutschlands, v. 2, p. 169.

Type-species: *Pompilus spinosus* Panzer. Desig. by Morice and Durrant, 1915.

*Alyson* Jurine, 1807. Nouv. Meth. Class. Hym. Dipt., p. 195.

Type-species: *Pompilus spinosus* Panzer. Monotypic.



These wasps are primarily Holarctic in distribution, but a few species occur in the Ethiopian and Oriental Regions. They nest gregariously, often in cool, moist sand, usually make multicellular nests, and prey primarily on nymphal and adult leafhoppers although spittle bugs and planthoppers are used occasionally.

Revision: Fox, 1894. Ent. News 5: 86-89 (N. Amer. spp.).

**conicus** Provancher. N. B., Ont., N. H., N. Y., Md., D. C., Va., Mich.

*Alyson*(!) *conicus* Provancher, 1889. Addit. Corr. Faune Ent. Canada Hym., p. 271. ♀.

**flavomaculatus** Cameron. N. Mex. (Santa Fe Mts.).

*Alyson*(!) *flavomaculatus* Cameron, 1901. Amer. Ent. Soc., Trans. 27: 314. ♂.

**guignardi** Provancher. Transcont., Que. and Ont. to N. C. and Mo., west to Mich., Iowa, Calif. and N. Mex. Predator: *Dioctria baumhaueri* Meig.

*Alyson*(!) *Guignardi* Provancher, 1887. Addit. Corr. Faune Ent. Canada Hym., p. 271. ♀, ♂.

*Alyson*(!) *petiolatus* Cameron, 1902. Amer. Ent. Soc., Trans. 28: 374. ♂.

*Alyson*(!) *interstitialis* Cameron, 1902. Amer. Ent. Soc., Trans. 28: 375. ♂.

**melleus** Say. U. and L. Austr. Zones east of 100th meridian. Ecology: Nests in damp sand or sandy loam, makes 1-5 cells per nest, stores 3-23 prey per cell. Parasite: *Phrosinella fulvicornis* (Coq.) ? Prey: *Aceratagallia* sp., *Agallia constricta* Van D., *Agalliopsis novella* (Say), *Balclutha* sp., *Chlorotettix* sp., *Ciminius hartii* Ball, *Colladonus citellarius* (Say), *Deltoccephalus flavicosta* Stal, *Draeculacephala antica* (Wlkr.), *D. mollipes* (Say), *D. paludosa* B. and C., *D. portola* Ball, *D. spp.*, *Empoasca fabae* (Harr.), *Exitanus exitiosus* Uhl., *Graminella nigrifrons* (Fbs.), *G. pallidula* Osb., *G. sp.*, *Hortensia similis* (Wlkr.), *Keonolla dolabrata* (Ball), *Macrosteles fascifrons* (Stal), *Neokolla hieroglyphica* (Say), *Paraphlepsius irroratus* (Say), *Sanctanus* sp., *Scaphytopius* sp., *Tylozygus bifidus* (Say), Cicadellinae spp.; Delphacidae sp.; Delphacidae sp.; both nymphs and adults are stored; cicadellids are preferred prey and delphacids are used rarely.

*Alyson*(!) *melleus* Say, 1837. Boston Jour. Nat. Hist. 1: 380. ♀.

Taxonomy: Evans and Lin, 1956. Amer. Ent. Soc., Trans. 82: 41, figs. 1-7 (larva). — Evans, 1959. Amer. Ent. Soc., Trans. 85: 150, fig. 60 (larva).

Biology: Hartman, 1905. Tex. Acad. Sci., Trans. 7: 56-57 (nest, prey transport). — Rau and Rau, 1918. Wasp studies afield, pp. 140-144, fig. 33 (nest, prey). — Evans, 1966. Compar. ethology and evolution of sand wasps, pp. 17-28, figs. 9-20 (nest, prey, mating, egg, life cycle, parasite ?). — Evans, 1968. Ent. Soc. Amer., Ann. 61: 1343 (prey). — Kurczewski and Kurczewski, 1971. Kans. Ent. Soc., Jour. 44: 335 (prey).

**oppositus** Say. Transit. and U. Austr. Zones east of Rocky Mts., N. B. and Ont. to Ga. and Tenn., west to Mich., Iowa and Colo. Prey: *Draeculacephala mollipes* (Say).

*Alyson*(!) *oppositus* Say, 1837. Boston Jour. Nat. Hist. 1: 380. ♀, ♂.

*Alyson*(!) *oppositus* var. *a* Say, 1837. Boston Jour. Nat. Hist. 1: 380.

Biology: Evans, 1966. Compar. ethology and evolution of sand wasps, p. 28 (prey).

Morphology: Snodgrass, 1941. Smithsn. Inst., Misc. Collect. 99 (14): pl. 20, figs. F-H (male genitalia).

**radiatus** Fox. Colo., Nev., Calif., Wash.

*Alyson*(!) *radiatus* Fox, 1894. Ent. News 5: 87. ♀, ♂.

**striatus** Fox. D. C., N. Y.,

*Alyson*(!) *striatus* Fox, 1894. Ent. News 5: 88. ♂.

**triangulifer shawi** Bradley. Nev., B. C., Calif.

*Alyson* *shawi* Bradley, 1920. Amer. Ent. Soc., Trans. 46: 130. ♂.

**triangulifer triangulifer** Provancher. Ont. and Que. south to Md., Mich. and Ky. west to N. Dak. and Colo., Idaho, Alaska.

*Alyson*(!) *triangulifer* Provancher, 1887. Addit. Corr. Faune Ent. Canada Hym., p. 272. ♂.

### Genus DIDINEIS Wesmael

*Didineis* Wesmael, 1852. Acad. Roy. Belg., Bul. 19: 109.

Type-species: *Alyson*(!) *lunicornis* of Vander Linden. Monotypic.

The European *lunicornis* (F.) makes a unicellular nest in the ground and preys upon nymphal and adult Cicadellidae and Delphacidae.

Revision: Fox, 1894. Ent. News 5: 126-128 (N. Amer. spp.). — Malloch and Rohwer, 1930. U. S. Natl. Mus., Proc. 77 (14): 1-7, 8 figs. (N. Amer. spp.).

*dilatata* Malloch and Rohwer. Wis., Nebr.

*Didineis dilatata* Malloch and Rohwer, 1930. U. S. Natl. Mus., Proc. 77 (14): 6. ♂.

*latimana* Malloch and Rohwer. N. H. to Va., Ill., Iowa, Mo.

*Didineis latimana* Malloch and Rohwer, 1930. U. S. Natl. Mus., Proc. 77 (14): 4. ♀, ♂.

*nodosa* Fox. Colo., Utah, Idaho, Wash. to Calif.; Mexico (Baja California).

*Didineis nodosa* Fox, 1894. Ent. News 5: 127. ♂.

*Didineis sanctacrucae* Bradley, 1920. Amer. Ent. Soc., Trans. 46: 129. ♀.

*Didineis nodosa* var. *clypeata* Malloch and Rohwer, 1930. U. S. Natl. Mus., Proc. 77 (14): 6. ♂.

*peculiaris* Fox. Iowa, Mont., Calif.; Mexico (Baja California).

*Didineis peculiaris* Fox, 1894. Ent. News 5: 128. ♀, ♂.

*stevensi* Rohwer. N. Dak. (Sheldon).

*Didineis stevensi* Rohwer, 1923. Ent. Soc. Wash., Proc. 25: 98. ♀.

*texana* (Cresson). Mostly U. and L. Austr. Zones, Pa. and N. J. to Fla., west to Kans., Mo. and east. Ariz.; Mexico (Nuevo Leon). Prey: *Cixius stigmatus* Say.

*Alyson*(!) *texanus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 226. ♂.

Biology: Strandtmann, 1945. Ent. Soc. Amer., Ann. 38: 312 (prey).

*vierecki* Rohwer. Kans., N. Mex.

*Didineis crassicornis* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 204. ♂. Preocc.

*Didineis vierecki* Rohwer, 1911. Ent. Soc. Wash., Proc. 13: 4. N. name.

#### SUBFAMILY NYSSONINAE

The wasps of this subfamily are cleptoparasites in the nests of other ground-nesting aculeates. The more primitive genera have as their hosts wasps belonging to the closely allied Gorytinae. Two of the more highly specialized genera appear to have as hosts Larrinae (Larridae) and CERCINAE (Philanthidae), and a third may have an andrenid bee as its host.

Revision: Cresson, 1882. Amer. Ent. Soc., Trans. 9: 273-284. — Fox, 1896. N. Y. Ent. Soc., Jour. 4: 10-16. — Pate, 1938. Amer. Ent. Soc., Trans. 64: 121-127 (key to gen.).

Taxonomy: Maidl and Klima, 1939. Hym. Cat., Pars 8, Sphecidae i, pp. 115-150 (world catalog).

Biology: Evans, 1966. Compar. ethology and evolution of sand wasps, pp. 83-90, figs. 46-51 (compar. behavior and host relationships).

#### Genus NYSSON Latreille

*Nysson* Latreille, 1796. Precis Caract. Gen. Ins., p. 125. No species included. Printer's error for *Nysson*?

*Nysson* Latreille, 1802-1803. Hist. Nat. Crust. Ins., v. 3, p. 340.

Type-species: *Crabro spinosus* Fabricius. Desig. by Shuckard, 1837.

*Nyssonus* Rafinesque, 1815. Analyse Nature ou Tabl. Univers, Palermo, p. 124. Emend.

Taxonomy: Menke, Bohart and Richards, 1974. Bul. Zool. Nomencl. 30: 217-218 (petition to suppress *Nysson* Latr., 1796, designate *Sphex spinosus* Forst. as type-species, and place *Nysson* Latr., 1802-1803, and *spinosus* Forst. on Official Lists of Generic and Specific Names).

*argenticus* Bohart. South. Calif. and Ariz.

*Nysson argenticus* Bohart, 1968 (1967). Pan-Pacific Ent. 43: 315, figs. 1, 10, 13, 22. ♂, ♀.

*aridulus* Bohart. South. Calif.

*Nysson aridulus* Bohart, 1968 (1967). Pan-Pacific Ent. 43: 317, figs. 9, 26. ♂, ♀.

**bakeri** Bohart. South. Calif.

*Nysson bakeri* Bohart, 1968 (1967). Pan-Pacific Ent. 43: 318, figs. 7, 27. ♂, ♀.

**chumash** Pate. Calif.

*Nysson (Nysson) chumash* Pate, 1940. Notulae Nat. 63: 1. ♂.

**compactus** Cresson. Wash.

*Nysson compactus* Cresson, 1882. Amer. Ent. Soc., Trans. 9: 278. ♀, ♂.

**daeckei** Viereck. Mass., N. Y., N. J., Pa., Mich., Iowa, Alta. Host: *Gorytes canaliculatus* Pack., *Hoplisoides nebulosus* (Pack.).

*Nysson daeckei* Viereck, 1904. Amer. Ent. Soc., Trans. 30: 238. ♂.

Taxonomy: Evans and Lin, 1956. Amer. Ent. Soc., Trans. 82: 42, figs. 8-12 (larva). — Evans, 1959. Amer. Ent. Soc., Trans. 85: 150 (larva).

Biology: Evans and Lin, 1956. Amer. Ent. Soc., Trans. 82: 43 (host). — Evans, 1966. Compar. ethology and evolution of sand wasps, pp. 44, 46, 64-65, fig. 36 (behavior, host, egg).

**euphorbiae** Bohart. South. N. Mex., Ariz., Calif.; Mexico (Sinaloa).

*Nysson euphorbiae* Bohart, 1968 (1967). Pan-Pacific Ent. 43: 319, figs. 2, 25. ♂, ♀.

**fidelis** Cresson. Wis., Colo., Mont., Wash., Oreg. Host: *Gorytes canaliculatus* Pack.

*Nysson fidelis* Cresson, 1882. Amer. Ent. Soc., Trans. 9: 282. ♀, ♂.

Biology: Barth, 1907. Wis. Nat. Hist. Soc., Bul. 5: 145, 147-148 (host).

**gagates** Bradley. B. C., N. Y., Miss.

*Nysson (Brachystegus) gagates* Bradley, 1920. Amer. Ent. Soc., Trans. 46: 123. ♂.

**hesperus** Bohart. B. C., Oreg., Calif., Nev., Idaho, Wyo.

*Nysson hesperus* Bohart, 1968 (1967). Pan-Pacific Ent. 43: 320, figs. 8, 14, 18, 23. ♂, ♀.

**lateralis** Packard. Chiefly Transit. Zone east of Rockies. Host: *Gorytes canaliculatus* Pack.?

*Nysson laterale* Harris, 1835. In Hitchcock, Rpt. Geol. Mineral. Bot. Zool. Mass., p. 68. Nom. nud.

*Nysson laterale* Packard, 1867. Ent. Soc. Phila., Proc. 6: 440. ♂.

Biology: Evans, 1966. Compar. ethology and evolution of sand wasps, p. 65 (host ?).

**neorusticus** Bohart. Calif., Nev., Oreg., Wash., Utah, Wyo.

*Nysson neorusticus* Bohart, 1968 (1967). Pan-Pacific Ent. 43: 321, figs. 4, 12, 24. ♂, ♀.

**pumilus** Cresson. Nev., Calif. Host: *Hoplisoides hamatus* (Handl.)?

*Nysson pumilus* Cresson, 1882. Amer. Ent. Soc., Trans. 9: 283. ♂.

*Nysson (Brachystegus) pumilis* (!) Bradley, 1920. Amer. Ent. Soc., Trans. 46: 125. ♀.

Biology: Powell and Chemsak, 1959. Pan-Pacific Ent. 35: 200 (host ?).

**recticornis** Bradley. Wash., Idaho, Calif.

*Nysson (Nysson) recticornis* Bradley, 1920. Amer. Ent. Soc., Trans. 46: 127. ♂.

**rufiventris** Cresson. Colo., Mont.

*Nysson rufiventris* Cresson, 1882. Amer. Ent. Soc., Trans. 9: 283. ♀.

*Plenoculus punctatus* Ashmead, 1897. Psyche 8: 338. ♀.

**rufoflavus** Bohart. Calif. (Mt. Diablo).

*Nysson rufoflavus* Bohart, 1968 (1967). Pan-Pacific Ent. 43: 322, figs. 5, 21. ♂.

**rusticus rusticus** Cresson. Colo., Idaho, Wash., Oreg., Calif. Host: *Hoplisoides hamatus* (Handl.)?

*Nysson rusticus* Cresson, 1882. Amer. Ent. Soc., Trans. 9: 282. ♀, ♂.

Biology: Powell and Chemsak, 1959. Pan-Pacific Ent. 35: 200 (host ?). — Evans, 1970. Mus. Compar. Zool., Bul. 140: 494 (host ?).

**rusticus sphecodoides** Bradley. Calif. (Claremont).

*Nysson (Nysson) sphecodoides* Bradley, 1920. Amer. Ent. Soc., Trans. 46: 126. ♂.

**schlingeri** Bohart. Calif.

*Nysson schlingeri* Bohart, 1968 (1967). Pan-Pacific Ent. 43: 323, figs. 6, 15, 16, 20. ♂, ♀.

**simplicicornis** Fox. N. Y., Pa., Md., D. C., Va., W. Va., Mich., Iowa, Nebr., Mo.

*Nysson simplicicornis* Fox, 1896. N. Y. Ent. Soc., Jour. 4: 15. ♂.

*Brachystegus maculipes* Mickel, 1916. Amer. Ent. Soc., Trans. 42: 400. ♀.

- Nysson (Nysson) minimus* Rohwer, 1921. U. S. Natl. Mus., Proc. 59: 408. ♀, (♂ misdet.). Preocc.
- Nysson (Nysson) kaskaskia* Pate, 1938. Amer. Ent. Soc., Trans. 64: 130. N. name.
- subtilis* Fox, N. Y., N. J., Pa., Md., D. C., W. Va.
- Nysson subtilis* Fox, 1896. N. Y. Ent. Soc., Jour. 4: 14. ♂.
- timberlakei* Bohart. South. Calif., Nev., N. Mex.
- Nysson timberlakei* Bohart, 1968 (1967). Pan-Pacific Ent. 43: 324, figs. 3, 19, 28. ♂, ♀.
- trichrus* (Mickel). Que., N. Y., N. J., Pa., D. C., Va., Iowa, Nebr., Kans., Tex., Ala.
- Nysson nigripes* Provancher, 1887. Addit. Corr. Faune Ent. Canada Hym., p. 269. "♂" = ♀. Preocc.
- Brachystegus trichrus* Mickel, 1916. Amer. Ent. Soc., Trans. 42: 400. ♀.
- Nysson (Nysson) melanopus* Pate, 1938. Amer. Ent. Soc., Trans. 64: 130. N. name.
- tristis* Cresson. B. C., Wash., Oreg., Calif.
- Nysson tristis* Cresson, 1882. Amer. Ent. Soc., Trans. 9: 281. ♂.

#### Genus HYPONYSSON Cresson

- Hyponysson* Cresson, 1882. Amer. Ent. Soc., Trans. 9: 273.
- Type-species: *Hyponysson bicolor* Cresson. Monotypic.
- Revision: Pate, 1938. Amer. Ent. Soc., Trans. 64: 131-135, fig. 23. (N. Amer. spp.).
- bicolor* Cresson. Idaho, Wash., Oreg., Calif.
- Hyponysson bicolor* Cresson, 1882. Amer. Ent. Soc., Trans. 9: 284. ♀.
- raui* (Rohwer). Fla., Ala., Tenn., Mo., Ark., Okla., Tex. Host: *Calliopsis nebrascensis* Cwfd.?
- Nysson (Hyponysson) raii* Rohwer, 1917. U. S. Natl. Mus., Proc. 53: 176. ♀.
- Biology: Rau, 1922. Acad. Sci. St. Louis, Proc. 24: 18 (host ?).

#### Genus SYNNEVRUS Costa

- Synnevrus* Costa, 1859. Fauna Regn. Napoli, Imen. Acul., Nyssonid., p. 16.
- Type-species: *Synnevrus procerus* Costa. Monotypic.
- Synnevrus* Gerstaecker, 1867. Naturforsch. Gesell. Halle 10: 79. Emend.
- These wasps occur in the Holarctic Region.
- aequalis* (Patton). Mass. south to Fla., La., Wis., Ill., Iowa, S. Dak.
- Nysson aequalis* Patton, 1879. Canad. Ent. 11: 212. ♂.
- aurinotus* (Say). Ga., Ohio, Ind., Ill., Wis., Minn., Iowa, S. Dak., Nebr., Tex., Colo.
- Nysson aurinotus* Say, 1837. Boston Jour. Nat. Hist. 1: 368.
- Nysson Freyi-Gessneri* Handlirsch, 1887. Akad. Wiss. Wien, Math.-Nat. Kl., Sitzber. 95: 355. ♂.
- Nysson angularis* Smith, 1908. Nebr. Univ. Studies 8: 340. ♂.
- Nysson (Nysson) marlatti* Rohwer, 1921. U. S. Natl. Mus., Proc. 59: 408. ♀.
- intermedius* (Viereck). Tex., N. Mex., Ariz., Calif.
- Nysson intermedius* Viereck, 1907. Amer. Ent. Soc., Trans. 33: 409. ♀.
- Nysson (Nysson) coyotero* Pate, 1940. Notulae Nat. 63: 3. ♀, ♂.
- maderae* Bohart. Ariz. (Santa Rita Mts.).
- Synnevrus(?) maderae* Bohart, 1968. Pan-Pacific Ent. 44: 233, fig. 13. ♂.
- plagiatus* (Cresson). U. S., east of Rockies. Host: *Sphex ichneumoneus* (L.)?
- Nysson plagiatus* Cresson, 1882. Amer. Ent. Soc., Trans. 9: 276. ♀, ♂.
- Biology: Ristich, 1953. Canad. Ent. 85: 380 (host ?).

#### Genus EPINYSSON Pate

- Nysson* subg. *Epinysson* Pate, 1935. Ent. News 46: 250.
- Type-species: *Nysson basilaris* Cresson. Orig. desig.
- Authenticated hosts for this genus are all in the genus *Hoplisoides* (Gorytinae). *Epinysson* occurs only in the New World.

Taxonomy: Bradley, 1920. Amer. Ent. Soc., Trans. 46: 122-123 (key to spp.).

**albomarginatus** (Cresson). Nev.

*Nysson albomarginatus* Cresson, 1882. Amer. Ent. Soc., Trans. 9: 278. ♀, ♂.

**arentis** Bohart. South. Calif., Nev., Ariz.

*Epinysson arentis* Bohart, 1968. Pan-Pacific Ent. 44: 229, figs. 16-18. ♂, ♀.

**basilaris basilaris** (Cresson). Va., S. C., Ga., Fla.

*Nysson basilaris* Cresson, 1882. Amer. Ent. Soc., Trans. 9: 281. ♀.

**basilaris tuberculatus** (Handlirsch). N. H., Conn., N. Y., N. J., Pa., Md., D. C., Va., S. C., Wis., N. Dak. Host: *Hoplisoides nebulosus* (Pack.).

*Nysson tuberculatus* Handlirsch, 1887. Akad. Wiss. Wien, Math.-Nat. Kl., Sitzber. 95: 363. ♂.

*Nysson tramosericus* Viereck, 1904. Amer. Ent. Soc., Trans. 30: 237. ♂.

*Nysson (Brachystegus) opulentus* var. *dakotensis* Rohwer, 1921. U. S. Natl. Mus., Proc. 59: 411. ♂.

Taxonomy: Evans, 1959. Amer. Ent. Soc., Trans. 85: 150-151, figs. 36-38 (larva; misdet. as *opulentus* Gerst.).

Biology: Evans, 1959. Amer. Ent. Soc., Trans. 85: 151 (host; misdet. as *opulentus* Gerst.).

—Evans, 1966. Compar. ethology and evolution of sand wasps, pp. 42-44, figs. 34-35 (behavior, host, egg).

**bellus** (Cresson). Kans., Okla., N. Dak., Colo., Mont., Tex., N. Mex., Ariz., Calif. Host:

*Hoplisoides tricolor* (Cr.)?

*Nysson bellus* Cresson, 1882. Amer. Ent. Soc., Trans. 9: 280. ♀.

*Nysson clarconis* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 204. ♂.

Biology: Evans, Lin and Yoshimoto, 1954. Ent. News 65: 10 (behavior in host? nest).

**desertus** Bohart. South. Calif., N. Mex.; Mexico (Sinaloa).

*Epinysson desertus* Bohart, 1968. Pan-Pacific Ent. 44: 231, figs. 19, 20. ♂, ♀.

**guatemalensis hoplisivora** (Rohwer). D. C. to Fla. Host: *Hoplisoides costalis* (Cr.). Typical *guatemalensis* (Roh.) occurs in Cent. America.

*Nysson (Brachystegus) hoplisivora* Rohwer, 1923. Ent. Soc. Wash., Proc. 25: 96. ♀.

Biology: Reinhard, 1925. Wash. Acad. Sci., Jour. 15: 172-177 (host, egg, larval behavior, life cycle, cocoon). —Reinhard, 1929. The witchery of wasps, pp. 262-271, text fig. (host, larval behavior, cocoon).

**mellipes** (Cresson). N. H. to Fla., La., Minn., Iowa, N. Dak., Colo., Mont., Calif., B. C.

*Nysson mellipes* Cresson, 1882. Amer. Ent. Soc., Trans. 9: 279. ♀, ♂.

*Nysson submellipes* Viereck, 1904. Amer. Ent. Soc., Trans. 30: 237. ♂.

**metathoracicus** (Smith). Nebr. (Sioux Co.).

*Brachystegus metathoracicus* Smith, 1908. Nebr. Univ. Studies 8: 338. ♀.

**moestus** (Cresson). Wash., Calif. Host: *Hoplisoides hamatus* (Handl.)?

*Nysson moestus* Cresson, 1882. Amer. Ent. Soc., Trans. 9: 280. ♂.

*Nysson (Brachystegus) barberi* Rohwer, 1921. U. S. Natl. Mus., Proc. 59: 410. ♂.

Biology: Powell and Chemsak, 1959. Pan-Pacific Ent. 35: 200 (host ?).

**opulentus** (Gerstaecker). Canada and U. S. in U. Austr., and Sonor. Zones; Panama?

*Nysson opulentus* Gerstaecker, 1867. Naturhist. Gesell. Halle, Abhandl. 10: 114. ♂.

*Nysson (Brachystegus) seminole* Bradley, 1920. Amer. Ent. Soc., Trans. 46: 125. ♂.

*Nysson (Brachystegus) foxii* Rohwer, 1921. U. S. Natl. Mus., Proc. 59: 409. ♂.

*Nysson (Epinysson) maiiae* Pate, 1938. Amer. Ent. Soc., Trans. 64: 137, fig. 26. ♂.

**pacificus** (Rohwer). Calif. (Santa Barbara).

*Nysson (Brachystegus) pacificus* Rohwer, 1917. U. S. Natl. Mus., Proc. 53: 249. ♂.

**torridus** (Bohart). South. Calif., Nev.

*Epinysson torridus* Bohart, 1968. Pan-Pacific Ent. 44: 232, fig. 21. ♂, ♀.

### Genus ZANYSSON Rohwer

*Nysson* subg. *Zanysson* Rohwer, 1921. U. S. Natl. Mus., Proc. 59: 404.

Type-species: *Nysson texanus* Cresson. Orig. desig.

The genus is known only from the New World. Circumstantial evidence suggests that species of *Tachytes* may serve as hosts.

Revision: Rohwer, 1921. U. S. Natl. Mus., Proc. 59: 404-407 (N. Amer. spp.).

**mexicanus** (Cresson). Tex. (Brownsville); Mexico.

*Paranysson Mexicanus* Cresson, 1882. Amer. Ent. Soc., Trans. 9: 275. ♀, ♂.

*Nysson longispinis* Cameron, 1905. Amer. Ent. Soc., Trans. 31: 374. ♀.

**plesius** (Rohwer). N. Y., N. J., Md., D. C., Va., N. C., Fla., Ala., Miss., La., Mo., Kans., Tex., Ariz. Host: *Tachytes d. distinctus* Sm.?, *T. chrysocercus* Roh.?

*Nysson* (*Zanysson*) *plesia* Rohwer, 1921. U. S. Natl. Mus., Proc. 59: 406. ♀, ♂.

*Zanysson matinec* Pate, 1938. Amer. Ent. Soc., Trans. 64: 163. ♀, ♂.

*Zanysson tonto* Pate, 1940. Notulae Nat. 63: 6. ♂.

Biology: Evans, 1966. Compar. ethology and evolution of sand wasps, pp. 89-90 (hosts ?).

**texanus fuscipes** (Cresson). West. U. S.

*Paranysson fuscipes* Cresson, 1882. Amer. Ent. Soc., Trans. 9: 274. ♀, ♂.

*Nysson aureobalteatus* Cameron, 1901. Amer. Ent. Soc., Trans. 27: 313. ♂.

**texanus texanus** (Cresson). U. S. Host: *Tachytes exornatus* Fox?

*Nysson texanus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 223. ♀, ♂.

Biology: Cockerell, 1903. Entomologist 36: 100 (host ?).

Morphology: Snodgrass, 1941. Smithsn. Inst., Misc. Collect. 99 (14): pl. 20, figs. I-K (male genitalia).

### Genus FOXIA Ashmead

*Foxia* Ashmead, 1898. Ent. News 9: 187.

Type-species: *Foxia pacifica* Ashmead. Monotypic.

This genus is confined to the New World. Its hosts are unknown.

Revision: Pate, 1938. Amer. Ent. Soc., Trans. 64: 143-153, figs. 1, 6, 7, 13-16, 21, 22 (N. Amer. spp.).

**navajo** Pate. Okla., Tex., N. Mex., Ariz., Calif.

*Foxia navajo* Pate, 1938. Amer. Ent. Soc., Trans. 64: 146. ♀, ♂.

**pacifica** Ashmead. Calif.

*Foxia pacifica* Ashmead, 1898. Ent. News 9: 187. ♀, ♂.

**secunda** (Rohwer). Ariz., Calif.

*Nysson* (*Foxia*) *secunda* Rohwer, 1921. U. S. Natl. Mus., Proc. 59: 407. ♂.

### Genus METANYSSON Ashmead

*Metanysson* Ashmead, 1899. Canad. Ent. 31: 326.

Type-species: *Nysson solani* Cockerell. Orig. desig.

*Metanysson* subg. *Huachuca* Pate, 1938. Amer. Ent. Soc., Trans. 64: 185.

Type-species: *Metanysson* (*Huachuca*) *arivaipa* Pate. Orig. desig.

The genus occurs only in the New World. Circumstantial evidence suggests that species of *Cerceris* may be the hosts.

Revision: Pate, 1938. Amer. Ent. Soc., Trans. 64: 170-188, figs. 2, 3, 5, 9-12, 18-20 (N. Amer. spp.).

**arivaipa** Pate. Ariz. Host: *Cerceris graphica* Sm.?

*Metanysson* (*Huachuca*) *arivaipa* Pate, 1938. Amer. Ent. Soc., Trans. 64: 186. ♂.

Biology: Evans, 1966. Compar. ethology and evolution of sand wasps, p. 90 (host ?).

**coahuila** Pate. Calif., Ariz., Tex. Host: *Cerceris conifrons* Mick.?

*Metanysson* (*Metanysson*) *coahuila* Pate, 1938. Amer. Ent. Soc., Trans. 64: 183. ♀.

Biology: Evans, 1966. Compar. ethology and evolution of sand wasps, p. 90 (host ?).

**lipan** Pate. Tex. (Hudspeth Co.).

*Metanysson* (*Metanysson*) *lipan* Pate, 1938. Amer. Ent. Soc., Trans. 64: 176. ♂.

**solani** (Cockerell). N. Mex., Ariz.

*Nysson solani* Cockerell, 1895. Amer. Ent. Soc., Trans. 22: 294. ♀.

**yavapai** Pate. Ariz.

*Metanysson* (*Metanysson*) *yavapai* Pate, 1938. Amer. Ent. Soc., Trans. 64: 178. ♀, ♂.

#### SUBFAMILY GORYTINAE

This large subfamily of ground-nesting wasps is cosmopolitan in distribution. So far as recorded the species prey upon nymphal and adult Homoptera.

Revision: Handlirsch, 1888. Akad. Wiss. Wien, Math.-Nat. Kl., Sitzber. 97: 316-565, 3 pls. (spp. of world). — Fox, 1896 (1895). Acad. Nat. Sci. Phila., Proc., 47: 517-539 (N. Amer. spp.).

— Rohwer, 1921. U. S. Natl. Mus., Proc. 59: 412 (key to gen.).

Taxonomy: Maidl and Klima, 1939. Hym. Cat., Pars 8, Sphecidae 1, pp. 43-114 (world catalog).

#### Genus OCHLEROPTERA Holmberg

*Ochleroptera* Holmberg, 1903. Buenos Aires Mus. Nac. Hist. Nat., An. (3) 2: 487.

Type-species: *Ochleroptera oblita* Holmberg. Monotypic.

*Paramellinus* Rohwer, 1912. U. S. Natl. Mus., Proc. 41: 469.

Type-species: *Gorytes bipunctatus* Say. Orig. desig.

The species of this small genus occur only in the New World.

Taxonomy: Pate, 1947. Brooklyn Ent. Soc., Bul. 42: 65-70.

**bipunctata** (Say). U. and L. Austr. Zones of U. S. Ecology: Nests in sandy to heavier soil, makes several cells per nest, stores 6-18 prey per cell. Parasite: Miltogrammini sp. Prey: *Aceratagallia sanguinolenta* (Prov.), *Coelidia olitoria* (Say), *Colladonus clitellarius* (Say), *Japananus hyalinus* (Osb.), *Macrosteles fascifrons* Stal, *M. sp.*, *Orientus ishidae* Mats., *Paraphlepsius irroratus* (Say), *Prescottia lobata* (Van D.), *Scaphytopius sp.*, *Strangania apicalis* Osb. and Ball; *Clastoptera obtusa* Say, *Philaenus leucophthalmus* L., *P. lineatus* L.; *Cyrtolobus acutus* Van D.; *Haplaxius radialis* Osb.; *Psylla annulata* F.; adults are stored more commonly than nymphs.

*Gorytes bipunctatus* Say, 1824. In Keating, Narr. Long's 2nd Exped., v. 2, p. 338.

Taxonomy: Evans and Lin, 1956. Amer. Ent. Soc., Trans. 82: 47, figs. 23-29 (larva). — Evans, 1959. Amer. Ent. Soc., Trans. 85: 152 (larva).

Biology: Strandtmann, 1945. Ent. Soc. Amer., Ann. 38: 312 (nest, prey). — Evans, 1966.

Compar. ethology and evolution of sand wasps, pp. 75-77, fig. 42 (nest, prey transport, life cycle, cocoon, parasite). — Evans, 1968. Ent. Soc. Amer., Ann. 61: 1344 (prey).

— Kurczewski and Kurczewski, 1971. Kans. Ent. Soc., Jour. 44: 335 (prey).

#### Genus ARGOGORYTES Ashmead

*Argogorytes* Ashmead, 1899. Canad. Ent. 31: 324.

Type-species: *Gorytes carbonarius* Smith. Orig. desig.

*Argogorytes* subg. *Archarpactus* Pate, 1937. Amer. Ent. Soc., Mem. 9: 4, 10.

Type-species: *Sphex mystacea* Linnaeus. Orig. desig. Replacement name proposed unnecessarily for *Arpactus* Jurine which was suppressed in Op. 135, 1939, Internatl. Comn. Zool. Nomencl.

Two Palearctic species nest in the ground, make 6-9 cells per nest, and store 19-27 nymphal spittlebugs (*Aphrophora*) per cell.

**nigrifrons** (Smith). N. S., south to Ga., Wis., Iowa, Kans., Tex.

*Gorytes nigrifrons* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 368. ♀.

*Gorytes Bollii* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 225. ♀.

*Gorytes* (*Gorytes*) *neglectus* Rohwer, 1911. U. S. Natl. Mus., Proc. 40: 567. ♀.

**sapellonis** (Baker). N. Mex. (Sapello Canyon).

*Gorytes sapellonis* Baker, 1907. Invertebrata Pacifica 1: 161. ♀.

## Genus DIENOPLUS Fox

*Arpactus* Jurine, 1807. Nouv. Meth. Class. Hym. Dipt., p. 192. Preocc.

Type-species: *Arpactus formosus* Jurine. Desig. by Shuckard, 1837.

*Harpactus* Shuckard, 1837. Essay on Indig. Fossor. Hym., p. 221. Emend.

*Harpactes* Dahlbom, 1843. Hym. Europaea, v. 1, p. 147. Emend. Preocc.

*Dienoplus* Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc., 45: 548.

Type-species: *Dienoplus pictifrons* Fox. Orig. desig.

Most species occur in the Holarctic Region, but a few have been recorded from the Ethiopian and Oriental Regions. A European species makes 2-15 cells per nest in sandy soil. Recorded prey are leafhoppers and spittlebugs, both nymphs and adults.

*citipes* Krombein. Fla., (Orlando, Arcadia). Ecology: Nests in flat sandy areas.

*Dienoplus citipes* Krombein, 1954. Amer. Ent. Soc., Trans. 80: 20, figs. 9, 11, 13. ♂, ♀.

*gyponae* (Williams). Kans., N. Mex., Alta. Ecology: Nests in sand, makes more than 2 cells per nest, stores 4 prey per cell. Prey: *Prairiana cinerea* (Uhl.) adults and nymph.

*Harpactus gyponae* Williams, 1914 (1913). Kans. Univ. Sci. Bul. 8: 223. ♀.

Biology: Williams, 1914 (1913). Kans. Univ. Sci. Bul. 8: 225-226, pl. 33, fig. 5 (nest, prey transport).

*mendicus* (Handlirsch). B. C., Idaho.

*Gorytes mendicus* Handlirsch, 1893. K. K. Naturhist. Hofmus., Ann. 8: 278. ♀.

*pictifrons* Fox. Idaho, Wash., Calif. Predator: *Philanthus pulcher* D. T.

*Dienoplus pictifrons* Fox, 1894 (1893). Acad. Nat. Sci. Phila., Proc., 45: 549. ♀, ♂.

*Harpactus howardi* Ashmead, 1899. Ent. News 10: 9. ♀.

## Genus HAPALOMELLINUS Ashmead

*Hapalomellinus* Ashmead, 1899. Canad. Ent. 31: 300.

Type-species: *Gorytes eximius* Provancher. Orig. desig.

This small genus occurs only in the desert areas of southwestern North America.

Taxonomy: Bohart, 1971. Biol. Soc. Wash., Proc. 83: 452 (key to spp.).

*albitomentosus* (Bradley). Tex., N. Mex., Ariz., Calif. Ecology: Nests in level, dry sandy soil, makes 1-2 cells per nest, one of which may be just a storage cell, and stores 14-15 leafhoppers per cell. Parasite: *Senotainia* sp. in *trilineata* (Wulp) complex? Prey:

*Stragania robusta* Uhl., mostly adults, but a few nymphs.

*Gorytes eximius* Provancher, 1888. Addit. Corr. Faune Ent. Canada Hym., p. 274. ♀. Preocc.

*Gorytes* (*Arpactus*) *albitomentosus* Bradley, 1920. Amer. Ent. Soc., Trans. 46: 121. ♀, ♂.

Biology: Cazier and Mortenson, 1965. Wasmann Jour. Biol. 22: 261-276 (nest, prey, parasite ?).

*pulvis* Bohart. South. N. Mex., Ariz. and Calif.

*Hapalomellinus pulvis* Bohart, 1971. Biol. Soc. Wash., Proc. 83: 451. ♀, ♂.

*teren* Pate. Ariz., Calif.

*Hapalomellinus teren* Pate, 1946. Ent. News 57: 237. ♀.

## Genus TRICHOGORYTES Rohwer

*Trichogorytes* Rohwer, 1912. U. S. Natl. Mus., Proc. 41: 469.

Type-species: *Trichogorytes argenteopilosus* Rohwer. Orig. desig.

The two known species occur in the southwestern deserts.

Revision: Pate, 1946. Brooklyn Ent. Soc., Bul. 41: 15-17.

*argenteopilosus* Rohwer. Ariz., Calif.

*Trichogorytes argenteopilosus* Rohwer, 1912. U. S. Natl. Mus., Proc. 41: 470. ♀.



**cockerelli** (Ashmead). N. Mex. (Mesilla). Ecology: Makes up to 2 cells per nest in fine-grained sand in dunes, stores 8-10 prey per cell. Prey: *Exitionus exitiosus* (Uhl.), *Circulifer tenellus* (Baker), *Norvellina* sp.; stores mostly adults.  
*Harpactus cockerelli* Ashmead, 1899. Ent. News 10: 10. ♀.

Biology: Evans, 1976. Ent. News 87: 33-37, 4 figs. (nest, prey).

### Genus GORYTES Latreille

*Gorytes* Latreille, 1804. Nouv. Dict. Hist. Nat., v. 24, Tabl. Meth., p. 180.

Type-species: *Mellinus quinquecinctus* Fabricius. Monotypic.

*Arpactus* Panzer, 1805. Faunae Ins. German., heft 98, No. 17.

Type-species: *Mellinus quadrifasciatus* Fabricius. Monotypic.

*Arpactus* Panzer, 1806. Krit. Rev. Insektenf. Deutschlands, p. 164. Preocc.

Type-species: *Mellinus quadrifasciatus* Fabricius. Desig. by Pate, 1937.

*Euzonia* Stephens, 1829. System. Cat. Brit. Ins., p. 363.

Type-species: *Mellinus quinquecinctus* Fabricius. Desig. by Pate, 1937.

*Hoplilus* Lepeletier, 1832. Soc. Ent. France, Ann. 1: 61.

Type-species: *Hoplilus quinquecinctus* of Lepeletier. Desig. by Westwood, 1839.

*Euspongius* Lepeletier, 1832. Soc. Ent. France, Ann. 1: 66.

Type-species: *Euspongius laticinctus* Lepeletier. Desig. by Westwood, 1839.

This genus occurs in the Holarctic and Ethiopian Regions. Prey records include Cicadellidae, Fulgoridae, Cercopidae and Membracidae. The multicellular nests may contain up to four cells, and 4-19 prey may be stored per cell.

**albosignatus** Fox. N. Dak., S. Dak., Nebr., Colo., Mont., Idaho.

*Gorytes albosignatus* Fox, 1892. Canad. Ent. 24: 152. ♀, ♂.

**angustus** (Provancher). Nev., Calif., Wash., B. C.

*Hoplilus angustus* Provancher, 1895. Nat. Canad. 22: 141. "♀" = ♂.

*Hoplilus angustatus*(!) Ashmead, 1899. Canad. Ent. 31: 328.

**atricornis** Packard. Transcont. in Transit. and U. Austr. Zones. Prey: *Aphrophora parallela* (Say); *Cyrtolobus tuberosus* (Fairm.); adults.

*Odquernus*(?) *atricornis* Harris, 1835. In Hitchcock, Rpt. Geol. Mineral. Bot. Zool. Mass., p. 68. Nom. nud.

*Gorytes atricornis* Packard, 1867. Ent. Soc. Phila., Proc. 6: 428. ♀, ♂.

*Gorytes rugosus* Packard, 1867. Ent. Soc. Phila., Proc. 6: 427. ♂.

*Gorytes decorus* Fox, 1896 (1895). Acad. Nat. Sci. Phila., Proc., 45: 535. ♀, ♂.

*Hoplilus elegantulus* Smith, 1908. Nebr. Univ. Studies 8: 346. ♂.

Biology: Pate, 1946. Brooklyn Ent. Soc., Bul. 41: 99 (prey). — Evans, 1966. Compar. ethology and evolution of sand wasps, p. 67 (prey).

**atrifrons** Fox. Colo., Nev., Calif.

*Gorytes atrifrons* Fox, 1892. Canad. Ent. 24: 151. ♀, ♂.

**canaliculatus** Packard. Transeont. in Transit. and U. Austr. and Sonor. Zones. Ecology: Nests both in sand and compacted soil, makes 1-4 cells per nest, stores 6-26 prey per cell.

Parasite: *Metopia argyrocephala* (Meig.), *Senotainia trilineata* (Wulp)?, *Phrosinella fulvicornis* (Coq)?, *P. fumosa* Allen?; *Timulla leona* (Bl.)?; *Nysson fidelis* Cr., *N. daeckei* Vier., *N. lateralis* Pack. Prey: *Idiocerus apache* Ball and Prkr., *I. cinctus*

DeLong and Cald., *I. lachrymalis* Fitch, *I. pallidus* Fitch, *I. perplexus* Gill. and Baker, *I. populi suturalis* Fitch, *I. snowi* Gill. and Baker, *I. stigmatalis* Lewis, *I. spp.*, *Macropsis viridis* (Fitch), *M. sp.*, *Norvellina helenae* Ball, *Oncopsis sp.*, *Orientus ishidae* Mats., *Paraphlepsius sp.*, *Stragania alabamensis* Baker; *Haplaxius pictifrons* Stal; nymphs and adults.

*Gorytes canaliculatus* Packard, 1867. Ent. Soc. Phila., Proc. 6: 428. ♀.

*Gorytes geminus* Handlirsch, 1888. Akad. Wiss. Wien, Math.-Nat. Kl., Sitzber. 97: 478. ♀, ♂.

*Gorytes asperatus* Fox, 1896 (1895). Acad. Nat. Sci. Phila., Proc., 45: 534. ♀, ♂.

*Hoplilus corrugis* Mickel, 1918 (1917). Nebr. Univ. Studies 17: 319. ♂.

*Gorytes* (*Hoplilus*) *carrugis*(!) Maidl and Klima, 1939. Hym. Cat., Pars 8, Sphecidae, v. 1, p. 101.

- Taxonomy: Evans and Lin, 1956. Amer. Ent. Soc., Trans. 82: 43-44, figs. 13-22 (larva).
- Biology: Barth, 1907. Wis. Nat. Hist. Soc., Bul. 5: 141-149, 3 figs. (nest, prey, parasite; observations probably based on both *canaliculatus* and *Hoplisoides nebulosus* (Pack.)). — Krombein, 1964 (1963). Brooklyn Ent. Soc., Bul. 58: 119 (nest, prey). — Evans, 1966. Compar. ethology and evolution of sand wasps, pp. 58-66, figs. 38, 39 (nest, prey, egg, life cycle, parasites). — Evans, 1968. Ent. Soc. Amer., Ann. 61: 1344 (prey). — Evans, 1970. Mus. Compar. Zool., Bul. 140: 494 (nest, prey, parasites). — Kurczewski and Kurczewski, 1971. Kans. Ent. Soc., Jour. 44: 335-336 (prey). — Alcock, 1973. Wasmann Jour. Biol. 31: 332-333, figs. 6, 10 (nest, prey transport). — Powell, 1974. Kans. Ent. Soc., Jour. 47: 1-7, 3 figs. (nest, prey transport, life cycle).
- cochisensis** Bohart. South. Ariz.  
*Gorytes cochisensis* Bohart, 1971. Biol. Soc. Wash., Proc. 83: 450. ♀, ♂.
- deceptor** Krombein. N. H. south to Va., west to Ont., Minn., Nebr., Kans. Prey: *Spissistylus constans* (Wlk.) adult.  
*Gorytes (Gorytes) deceptor* Krombein, 1958. Ent. Soc. Wash., Proc. 60: 62. ♀, ♂.
- Biology: Krombein, 1958. Ent. Soc. Wash., Proc. 60: 64 (prey).
- dorothyae** **dorothyae** Krombein. Md., N. C., La.  
*Gorytes (Gorytes) dorothyae* Krombein, 1950 (1949). Elisha Mitchell Sci. Soc., Jour. 65: 269. ♂.
- Taxonomy: Krombein, 1953. Wasmann Jour. Biol. 10: 335. ♀.
- dorothyae** **russeolus** Krombein. Fla.  
*Gorytes (Gorytes) dorothyae russeolus* Krombein, 1954. Amer. Ent. Soc., Trans. 80: 23. ♂, ♀.
- flagellatus** Bohart. Calif., Nev., Wash., B. C. Idaho, Wyo.  
*Gorytes flagellatus* Bohart, 1971. Biol. Soc. Wash., Proc. 83: 448. ♂, ♀.
- limbellus** Bohart. Calif.  
*Gorytes limbellus* Bohart, 1971. Biol. Soc. Wash., Proc. 83: 447. ♂, ♀.
- mcatee** Krombein and Bohart. N. Y., Pa., Md., D. C., Va.  
*Gorytes (Gorytes) mcatee* Krombein and Bohart, 1962. Biol. Soc. Wash., Proc. 75: 15. ♀.
- nevadensis** Fox. Nev., Colo., Idaho.  
*Gorytes nevadensis* Fox, 1892. Canad. Ent. 24: 150. ♀, ♂.
- prosopis** Bohart. Calif., Oreg.  
*Gorytes prosopis* Bohart, 1971. Biol. Soc. Wash., Proc. 83: 449. ♀.
- provancheri** Handlirsch. Wash., Oreg., Calif., Nev., Utah.  
*Gorytes laticinctus* Provancher, 1888. Addit. Corr. Faune Ent. Canada Hym., p. 274. ♂. Preocc.  
*Gorytes Provancheri* Handlirsch, 1895. Akad. Wiss. Wien, Math.-Nat. Kl., Sitzber. 104: 945. N. name.
- simillimus** Smith. N. S. to B. C. south to Ga., Ill., Kans. and Colo. Ecology: Nests in sand.  
 Prey: *Gyponana flavolineata* (Fitch), *G. melanota* Spang., *G. octolineata* (Say), *G. spp.*, *Scaphoideus productus* Osb.; mostly adults but a few nymphs.  
*Gorytes simillimus* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 367. ♀.  
*Gorytes ephippiatus* Packard, 1867. Ent. Soc. Phila., Proc. 6: 426. ♂.  
*Gorytes (Pseudoplisus) gyponacinus* Rohwer, 1911. U. S. Natl. Mus., Proc. 40: 568. ♀, ♂.
- Biology: Rohwer, 1911. U. S. Natl. Mus., Proc. 40: 568 (prey). — Krombein, 1936. Ent. News 47: 93-94 (prey transport). — Krombein, 1952. Amer. Ent. Soc., Trans. 78: 95 (nest, prey). — Evans, 1966. Compar. ethology and evolution of sand wasps, p. 66 (nest, prey). — Kurczewski and Kurczewski, 1971. Kans. Ent. Soc., Jour. 44: 336 (prey).
- umatillae** Bohart. West. U. S.  
*Gorytes vicinus* Handlirsch, 1893. K. K. Naturhist. Hofmus., Ann. 8: 279. ♀. Preocc.  
*Gorytes umatillae* Bohart, 1971. Biol. Soc. Wash., Proc. 83: 450. N. name.

### Genus PSEUDOPLISUS Ashmead

*Pseudoplisus* Ashmead, 1899. Canad. Ent. 31: 323.

Type-species: *Gorytes floridanus* Fox. Orig. desig.

*Laevigorytes* Zavadil, 1948. In Zavadil and Snoflak, Ent. Piruckyy Ent. Listu, no. 13, p. 66.

Type-species: *Gorytes kohlii* Handlirsch. Monotypic.

Most of the species are Nearctic but a few have been described from the Ethiopian and Palaearctic Regions. The only known prey record is of a spittlebug for one of the Ethiopian species.

Taxonomy: Bohart, 1969 (1968). Kans. Ent. Soc., Jour. 41: 494-496 (key to spp. of *Phaleratus* Group). — Bohart, 1969. Kans. Ent. Soc., Jour. 42: 392-394 (key to spp. of Montanus, Abdominalis, Fasciatus, Venustus and Smithii Groups).

**abdominalis** (Cresson). Colo., Tex.

*Gorytes abdominalis* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 474. ♀, ♂.

**apicalis** (Smith). N. J., S. C., Tex., N. Mex., Nebr.

*Gorytes apicalis* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 369. ♂.

*Gorytes propinquus* Cresson, 1868. Amer. Ent. Soc., Trans. 1: 379. "♀" = ♂.

**butleri** Bohart. Ariz.

*Pseudoplisus butleri* Bohart, 1969. Kans. Ent. Soc., Jour. 42: 397, figs. 1, 7. ♂.

**californicus** Bohart. Calif.

*Pseudoplisus californicus* Bohart, 1969. Kans. Ent. Soc., Jour. 42: 401, figs. 11, 12. ♂, ♀.

**catalinae** Bohart. Ariz. (Santa Catalina Mts.).

*Pseudoplisus catalinae* Bohart, 1969. Kans. Ent. Soc., Jour. 42: 395, figs. 13, 17. ♂, ♀.

**claripennis** Bohart. Ariz. (Santa Rita Mts.).

*Pseudoplisus claripennis* Bohart, 1969. Kans. Ent. Soc., Jour. 42: 403. ♂.

**divisus** (Smith). Va. to Ga., La., Tex., Nebr.

*Gorytes divisus* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 370. ♂.

*Gorytes bipartitus* Handlirsch, 1888. Akad. Wiss. Wien Math.-Nat. Kl., Sitzber.: 97: 521. ♀, ♂.

*Pseudoplisus varipunctus* Smith, 1908. Nebr. Univ. Studies 8: 348. ♀.

**fasciatus** (Fox). Colo., Ariz.

*Gorytes fasciatus* Fox, 1896 (1895). Acad. Nat. Sci. Phila., Proc., 45: 539. ♂.

**flavidulus** Bohart. South. Calif.

*Pseudoplisus flavidulus* Bohart, 1969. Kans. Ent. Soc., Jour. 42: 402. ♂.

**imperialis** Bohart. Calif. (Imperial Co.).

*Pseudoplisus imperialis* Bohart, 1969. Kans. Ent. Soc., Jour. 42: 403. ♂.

**nigricornis** Bohart. South. Ariz.

*Pseudoplisus nigricornis* Bohart, 1969. Kans. Ent. Soc., Jour. 42: 398, figs. 5, 10. ♂, ♀.

**ocellatus** Bohart. South. Calif.; Mexico (Baja California).

*Pseudoplisus ocellatus* Bohart, 1969. Kans. Ent. Soc., Jour. 42: 401. ♂, ♀.

**oraclensis** Bohart. South. Ariz.

*Pseudoplisus oraclensis* Bohart, 1969 (1968). Kans. Ent. Soc., Jour. 41: 498, figs. 4, 8. ♂, ♀.

**phaleratus** (Say). Canada and U. S. in Transit. and Austr. Zones; P. E. I. west to N. Dak. and Colo., south to Fla. and Ariz., south in Mexico to Guerrero.

*Odynerus(?) flavicornis* Harris, 1835. In Hitchcock, Rpt. Geol. Mineral. Bot. Zool. Mass., p. 68. Nom. nud.

*Gorytes phaleratus* Say, 1837. Boston Jour. Nat. Hist. 1: 367.

*Gorytes fulvipes* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 367. ♀.

*Gorytes modestus* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 473. ♂.

*Gorytes rufo-luteus* Packard, 1867. Ent. Soc. Phila., Proc. 6: 425. ♀, ♂.

*Gorytes flavicornis* Packard, 1867. Ent. Soc. Phila., Proc. 6: 429. ♀, ♂.

*Gorytes alticola* Cameron, 1890. Biol. Cent.-Amer., Hym., v. 2, p. 81, pl. 5, fig. 21. ♂, ♀.

*Gorytes alpestris* Cameron, 1890. Biol. Cent.-Amer., Hym., v. 2, p. 83, pl. 5, fig. 22. ♂, ♀.

*Gorytes subaustrius* Viereck, 1908 (1907). Amer. Ent. Soc., Trans. 33: 398. ♀.

*Gorytes papagorum* Viereck, 1908 (1907). Amer. Ent. Soc., Trans. 33: 400. ♀, ♂.

Morphology: Snodgrass, 1941. Smithsn. Inst., Misc. Collect. 99 (14): pl. 21, figs. H-K (male genitalia).

*rufomaculatus* (Fox). Nebr., Kans., Colo., Mont.

*Gorytes rufomaculatus* Fox, 1896 (1895). Acad. Nat. Sci. Phila., Proc., 45: 538. ♀, ♂.

*smithii floridanus* (Fox). Fla.

*Hoplisis foveolata* Fox, 1890. Ent. News 1: 106. ♀. Preocc.

*Gorytes floridanus* Fox, 1891. Ent. News 2: 196. N. name.

*smithii smithii* (Cresson). Md., N. C., Fla., Ill., Nebr., Kans., Okla., La.

*Gorytes Smithii* Cresson, 1880. Amer. Ent. Soc., Trans. 8: Proc., p. xviii. "♀" = ♂.

*Pseudoplisus infumatus* Mickel, 1916. Amer. Ent. Soc., Trans. 42: 402. ♂.

*tanythrix* Bohart. Okla., Tex.

*Pseudoplisus tanythrix* Bohart, 1969. Kans. Ent. Soc., Jour. 42: 399, figs. 6, 8, 14. ♂.

*venustus* (Cresson). Tex., N. Mex., Ariz., Utah, Colo.; Mexico (Chihuahua).

*Gorytes venustus* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 472. ♀, ♂.

*Gorytes* (*Pseudoplisus*) *venustiformis* Rohwer, 1911. U. S. Natl. Mus., Proc. 40: 568. ♂.

*wernerii* Bohart. Ariz., Colo.

*Pseudoplisus wernerii* Bohart, 1969 (1968). Kans. Ent. Soc., Jour. 41: 500, figs. 3, 11, 14. ♀, ♂.

### Genus LESTIPHORUS Lepeletier

*Lestiphorus* Lepeletier, 1832. Soc. Ent. France, Ann. 1: 70.

Type-species: *Crabro bicinctus* Rossi. Desig. by Internatl. Comn. Zool. Nomencl., Op. 675, 1963.

*Lestiphorus* Agassiz, 1847. Nomencl. Zool., p. 208. Emend.

*Hypomellinus* Ashmead, 1899. Canad. Ent. 31: 299.

Type-species: *Gorytes rufocinctus* Fox. Orig. desig.

*Mellinogastra* Ashmead, 1899. Canad. Ent. 31: 300.

Type-species: *Gorytes mellinoides* Fox. Orig. desig.

Most species are Holarctic but one each is known from the Neotropical and Ethiopian Regions. One European species is reported to prey upon spittlebugs.

Revision: Pate, 1946 (1945). Canad. Ent. 77: 210-213 (N. Amer. spp.).

Taxonomy: van der Vecht, 1961. Bul. Zool. Nomencl. 18: 340-341 (request to suppress *Crabro bicinctus* F. and to place *Lestiphorus* Lep. and *Crabro bicinctus* Rossi on Official Lists of Generic and Specific Names).

*cockerelli* (Rohwer). Mass., N. Y., Mich., S. Dak., Colo.

*Gorytes cockerelli* Rohwer, 1909. Ent. News 20: 371. ♂.

*Mellinogastra williamsi* Mickel, 1916. Amer. Ent. Soc., Trans. 42: 402. ♂.

*mellinoides* (Fox). Tex. (? Bosque Co.).

*Gorytes mellinoides* Fox, 1896 (1895). Acad. Nat. Sci. Phila., Proc. 45: 524. ♀.

*piceus* (Handlirsch). N. Dak., Idaho, Wash., B. C.

*Gorytes piceus* Handlirsch, 1888. Akad. Wiss. Wien, Math.-Nat. Kl., Sitzber. 97: 455. ♂.

*Gorytes rufocinctus* Fox, 1892. Canad. Ent. 24: 153. ♀.

### Genus ORYTTUS Spinola

*Oryttus* Spinola, 1836. Soc. Ent. France, Bul. 5: xxiii.

Type-species: *Arpactus concinnus* (Rossi). Monotypic.

*Agarptus* Wesmael, 1852. Acad. Roy. Sci. Belg., Bul. 19: 108.

Type-species: *Gorytes concinnus* of Vander Linden. Monotypic.

*Harpactostigma* Ashmead, 1899. Canad. Ent. 31: 299.

Type-species: *Hoplisis velutinus* Spinola. Orig. desig.

*Harpactostigma* subg. *Arcesilas* Pate, 1938. Amer. Ent. Soc., Trans. 64: 60.

Type-species: *Gorytes mirandus* Fox. Orig. desig.

Most species of this small genus occur in the Holarctic Region, but a few are Ethiopian and Neotropical. Several prey records are of Fulgoridae, but one European species also uses Cicadellidae.

Revision: Pate, 1938. Amer. Ent. Soc., Trans. 64: 57-77 (New World spp.).

Taxonomy: Bohart, 1968. Biol. Soc. Wash., Proc. 81: 431-438, 17 figs. (synopsis of New World taxa).

**gracilis arapaho** (Pate). Colo., Kans., Tex.

*Harpactostigma* (*Arcesilas*) *arapaho* Pate, 1938. Amer. Ent. Soc., Trans. 64: 67. ♀.

*Harpactostigma* (*Arcesilas*) *rutulum* Pate, 1938. Amer. Ent. Soc., Trans. 64: 69. ♂.

**gracilis gracilis** (Patton). U. S. in U. and L. Austr. Zones, east of 100th meridian.

*Hoplisis gracilis* Patton, 1879. Canad. Ent. 11: 210. ♀, ♂.

**laminiferus** (Fox). Calif., Wash., Idaho, Utah. Ecology: Nests in vertical clay bank, stores at least 5 prey per cell. Prey: *Scolops hesperius* Uhl. ?, nymphs and adults.

*Gorytes ruficornis* Provancher, 1888. Addit. Corr. Faune Ent. Canada Hym., p. 273. ♀, ♂. Preocc.

*Gorytes laminiferus* Fox, 1896 (1895). Acad. Nat. Sci. Phila., Proc. 45: 532. ♂.

*Hypomellinus flavicornis* Baker, 1907. Invertebrata Pacifica 1: 162. ♂.

*Gorytes* (*Hoplisis*) *rufulicornis* Maidl and Klima, 1939. Hym. Cat., Pars 8, Sphecidae, v. 1, p. 102. N. name.

Biology: Gittins, 1958. Pan-Pacific Ent. 34: 142 (nest, prey).

**mirandus** (Fox). Nev., Calif., Wash.

*Gorytes mirandus* Fox, 1892. Canad. Ent. 24: 152. ♂.

*Hoplisoides mirandus* (!) Ashmead, 1899. Canad. Ent. 31: 328.

**umbonatus** (Baker). Calif.

*Hoplisoides umbonatus* Baker, 1907. Invertebrata Pacifica 1: 163. ♂.

*Gorytes* (*Hoplisoides*) *femoratus* Bradley, 1920. Amer. Ent. Soc., Trans. 46: 119. ♂.

**yumae** Bohart. South. Ariz.

*Oryttus yumae* Bohart, 1968. Biol. Soc. Wash., Proc. 81: 436, figs. 4, 9, 13, 17. ♂, ♀.

### Genus PSAMMALETES Pate

*Hoplisoides* subg. *Psammaletes* Pate, 1936. Amer. Ent. Soc., Trans. 62: 49.

Type-species: *Gorytes bigeloviae* Cockerell and Fox. Orig. design.

This small genus occurs only in the Nearctic Region.

Revision: Pate, 1936. Amer. Ent. Soc., Trans. 62: 49-56.

**bigeloviae** (Cockerell). N. Mex., Ariz.; Mexico.

*Gorytes bigeloviae* Cockerell, 1897. In Cockerell and Fox, Acad. Nat. Sci. Phila., Proc. 49: 139. ♂.

**crucis** (Cockerell). Iowa, Nebr., N. Mex.; north. Mexico.

*Gorytes crucis* Cockerell, 1897. In Cockerell and Fox, Acad. Nat. Sci. Phila., Proc. 49: 140. ♀.

*Hypomellinus venustus* Mickel, 1916. Amer. Ent. Soc., Trans. 42: 403. ♂.

*Hypomellinus tricinctus* Mickel, 1916. Amer. Ent. Soc., Trans. 42: 404. ♀.

**mexicanus** (Cameron). N. Y., N. J., Md., D. C., Va., N. C., Ga., La., Ind.; Mexico (Yucatan).

Prey: *Ormenoides venusta* (Melichar).

*Gorytes mexicanus* Cameron, 1890. Biol. Cent.-Amer., Hym., v. 2, p. 76, pl. 5, fig. 15. ♀.

*Psammaletes pechumani* Pate, 1936. Amer. Ent. Soc., Trans. 62: 53. ♀.

Biology: Pate, 1946. Brooklyn Ent. Soc., Bul. 41: 99 (prey).

### Genus SPHECIUS Dahlbom

Taxonomy: Pate, 1936. Brooklyn Ent. Soc., Bul. 31: 198-200 (key to subg.).

#### Genus SPHECIUS Subgenus SPHECIUS Dahlbom

*Sphecius* Dahlbom, 1843. Hym. Europaea, v. 1, p. 154.

Type-species: *Sphecius speciosus* Dahlbom. Monotypic.

*Hogardia* Lepeletier, 1845. Hist. Nat. Ins. Hym., v. 3, p. 288.

Type-species: *Hogardia rufescens* Lepeletier. Type by tautonymy (= *Stizus hogardii* Latreille).

The typical subgenus occurs only in the New World. These large wasps are commonly called cicada killers. They frequently nest gregariously and dig burrows which may be as long as 4 feet, have a number of branches each of which may terminate in a cluster of 3 cells. One to as many as 4 prey may be stored per cell depending upon the size of the prey and the sex to be provided for.

Revision: Fox, 1895. Acad. Nat. Sci. Phila., Proc. 47: 264-266 (N. Amer. spp.).

**convallis** Patton. U. S. west of 100th meridian; Mexico (Baja California). Prey: *Diceroprocta apache* (Davis), *Tibicen pruinosus* (Say).

*Sphecius speciosus* var. *convallis* Patton, 1879. U. S. Geol. and Geog. Survey, Bul. 5: 343. ♀, ♂.

*Sphecius raptor* Handlirsch, 1889. Akad. Wiss. Wien, Math.-Nat. Kl., Sitzber. 98: 461. ♀, ♂. N. name.

Biology: Krombein, 1951. U. S. Dept. Agr., Monog. 2: 987 (prey). — Krombein, 1958. U. S. Dept. Agr., Monog. 2, Sup. 1, p. 193 (prey).

**grandis** (Say). Tenn., Mo., Ark., Tex., Kans., N. Mex., Ariz., Utah, Nev., Wash., Calif., south to Central America. Parasite: *Dasyneutilla klugii* (Gray)? Prey: *Tibicen dealbata* (Davis).

*Stizus grandis* Say, 1823. West. Quart. Rptr. 2: 77.

*Stizus fervidus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 223. ♀.

*Stizus nevadensis* Cresson, 1874. Amer. Ent. Soc., Trans. 5: 99. ♂.

Biology: Bradley, 1908. Ent. Soc. Amer., Ann. 1: 129 (sleeping aggregation). — Bradley, 1920. Ent. News 31: 112-113 (nest, parasite ?). — Evans, 1966. Compar. ethology and evolution of sand wasps, p. 110 (prey transport). — Alcock, 1975. Jour. Nat. Hist. 9: 561-566, 3 figs. (male territorial and mating behavior).

**hogardii** *hogardii* (Latreille). South Fla.; West Indies. Another subspecies occurs in the Bahamas.

*Stizus Hogardii* Latreille, 1809. Gen. Crust. Ins., v. 4, p. 100, pl. 13. ♀.

*Hogardia rufescens* Lepeletier, 1845. Hist. Nat. Ins. Hym., v. 3, p. 289. ♀. N. name.

**speciosus** (Drury). U. S. in U. and L. Austr. Zones east of Rockies, south into Mexico. Ecology:

Nests gregariously in light clay to sandy soil, the tunnel with several branches each with one or more cells and with an average of 15.8 cells per nest, usually stores 1-2 prey per cell. Parasite: *Senotainia trilineata* (Wulp), *Metopia argyrocephala* (Meigen). Prey: *Tibicen canicularis* Harr., *T. chloromera* Wlkr., *T. dorsata* Say, *T. linnei* Sm. and Grossb., *T. lyrice* DeG., *T. marginalis* Wlkr., *T. pruinosus* Say, *T. robinsoniana* Davis, *T. sayi* (Grossb.), *T. vitripennis* Say. This is commonly known as the cicada killer.

*Sphex speciosus* Drury, 1773. Illus. Nat. Hist., v. 2, p. 71. ♀.

*Vespa tricornis* Fabricius, 1775. Systema Ent., p. 363.

*Stizus vespiformis* Latreille, 1818. Tabl. Encycl. et Meth., pt. 24, pl. 382, fig. 6.

Taxonomy: Evans and Lin, 1956. Amer. Ent. Soc., Trans. 82: 46, figs. 30-36 (larva).

Biology: Riley, 1892. Insect Life 4: 248-252 (nest, prey). — Davis, 1920. Brooklyn Ent. Soc., Bul. 15: 128-129 (mating, prey transport). — Reinhard, 1929. The witchery of wasps, pp. 18-60, 4 pls. (nest, prey, cocoon, life cycle, mating, parasite). — Dow, 1942. Ent. Soc. Amer., Ann. 35: 310-317 (nest, prey). — Dambach and Good, 1943. Ohio Jour. Sci. 43: 32-41, figs. 1-6 (nest, prey, life history). — Lin, 1963. Behavior 20: 115-133, 6 figs. (territoriality of males). — Lin, 1964 (1963). Brooklyn Ent. Soc., Bul. 58: 121-123 (fighting of nesting females). — Lin, 1966. Anim. Behaviour 14: 130-131, pl. 6 (mating). — Evans, 1966. Compar. ethology and evolution of sand wasps, pp. 92-110, figs. 52-58 (nest, prey, egg, life cycle, parasites). — Lin, 1967. Science 157: 1334-1335, 1 fig. (sex roles in mating). — Lin, 1972. In Michener and Lin, Quart. Rev. Biol. 47: 139-140 (communal nest possession by several females).

Morphology: Snodgrass, 1941. Smithsn. Inst., Misc. Collect. 99 (14): pl. 18, figs. E-O (male genitalia).

### Genus TANYOPRYMNUS Cameron

*Tanyoprymnus* Cameron, 1905. Amer. Ent. Soc., Trans. 31: 375.

Type-species: *Tanyoprymnus longitarsis* Cameron. Monotypic.  
*Ceratostizus* Rohwer, 1921. U. S. Natl. Mus., Proc. 59: 412.

Type-species: *Gorytes moneduloides* Packard. Orig. desig.

Taxonomy: Pate, 1935. Ent. News 46: 249-250.

**moneduloides** (Packard). U. S. south into Mexico. Ecology: Nests in vertical sand banks. Prey: *Rhynchomitra microrhina* (Wlkr.) nymphs and adult; *Scolops sulcipes* (Say) adults, *S. sp.?* nymph.

*Gorytes moneduloides* Packard, 1867. Ent. Soc. Phila., Proc. 6: 431. ♂.

*Gorytes Belfragei* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 224. ♀.

*Tanyoprymnus longitarsis* Cameron, 1905. Amer. Ent. Soc., Trans. 31: 376. ♂.

Biology: Krombein, 1959. Ent. Soc. Wash., Proc. 61: 195 (nest, prey transport). — Evans, 1966. Compar. ethology and evolution of sand wasps, p. 80 (prey).

### Genus ARIGORYTES Rohwer

*Arigorytes* Rohwer, 1912. U. S. Natl. Mus., Proc. 41: 469.

Type-species: *Gorytes Coquillettii* Fox. Orig. desig.

This is a small genus occurring only in the deserts of western North America. Nothing is known of the biology.

Revision: Pate, 1947. Canad. Ent. 79: 51-56.

Taxonomy: Bohart, 1971. Biol. Soc. Wash., Proc. 83: 447 (key to N. Amer. spp.).

**coachellae** Bohart. Calif., Ariz., Nev., Colo.; Mexico (Baja California).

*Arigorytes coachellae* Bohart, 1971. Biol. Soc. Wash., Proc. 83: 445. ♂, ♀.

**coquillettii** (Fox). Calif.

*Gorytes Coquillettii* Fox, 1896 (1895). Acad. Nat. Sci. Phila., Proc. 47: 531. ♀.

**insolitus** (Fox). Nev., Calif., Oreg.

*Gorytes insolitus* Fox, 1896 (1895). Acad. Nat. Sci. Phila., Proc. 47: 532. ♂.

*Hoplisoides clavatus* Baker, 1907. Invertebrata Pacifica 1: 165. ♂.

**ruficrus** Bohart. Calif. at 5000-7000 ft. in central Sierra Mts.

*Arigorytes ruficrus* Bohart, 1971. Biol. Soc. Wash., Proc. 83: 446. ♂, ♀.

**smohalla** Pate. Idaho, Wash., Calif.

*Arigorytes smohalla* Pate, 1947. Canad. Ent. 79: 54. ♀, ♂.

### Genus XEROGORYTES Bohart

*Xerogorytes* Bohart, 1976. In Bohart and Menke, Sphecids wasps of the world, p. 517.

Type-species: *Arigorytes anaetis* Pate. Orig. desig.

This is a monotypic genus occurring only in the southwestern United States. The biology is unknown.

**anaetis** (Pate). Ariz., southwest. N. Mex.

*Arigorytes anaetis* Pate, 1947. Canad. Ent. 79: 55. ♀.

### Genus HOPLISOIDES Gribodo

*Hoplisoides* Gribodo, 1884. Ent. Soc. Ital., Bol. 16: 276.

Type-species: *Hoplisoides intricans* Gribodo. Monotypic.

*Icuma* Cameron, 1905. Entomologist 38: 21.

Type-species: *Icuma sericea* Cameron. Monotypic.

This large genus occurs in all of the major zoogeographic regions except the Australian. The species prefer to nest in sandy soil and make relatively short burrows ending in one or several cells. The recorded prey are all Homoptera belonging to the Membracidae, Cicadellidae or Fulgoridae; each species prefers prey of a single family usually.

**carinatus** Bohart. Ariz.; Mexico (Sonora).

*Hoplisoides carinatus* Bohart, 1968. Ent. Soc. Wash., Proc. 70: 287. ♂, ♀.

**cazieri** Bohart. South. Ariz.

*Hoplisoides cazieri* Bohart, 1968. Ent. Soc. Wash., Proc. 70: 288. ♂, ♀.

**confertus** (Fox). Western North America.

*Gorytes confertus* Fox, 1896 (1895). Acad. Nat. Sci. Phila., Proc. 47: 525. ♀, ♂.

*Gorytes (Hoplisoides) imperialensis* Bradley, 1920. Amer. Ent. Soc., Trans. 46: 117. ♂.

**costalis costalis** (Cresson). Alaska, U. S. east of 100th meridian. Ecology: Nests in sand, 1-2 cells per nest, 3-9 prey per cell. Parasite: *Amobia aurifrons* (Tns.); *Nysson hoplisivora* Roh.; *Notozus viridiganeus* (Nort.). Prey: *Archasia galeata* (F.), *Ceresa bubalus* F., *C. palmeri* Van D., *Thelia bimaculata* F., *T. sp.*, *Telamona monticola* F., *T. tristis* Fitch, *T. unicolor* Fitch, *Glossonota crataegi* Fitch, *Cyrtolobus arcuatus* Emm?, *Vanduzee arcuata* (Say), *Platycotis vittata* F., *Campylenchia latipes* Say, *Stictiocephala borealis* (Fairm.); only adults are used as prey.

*Gorytes costalis* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 225. ♀.

Taxonomy: Evans, 1959. Amer. Ent. Soc., Trans. 85: 151, figs. 39, 62 (larva).

Biology: Rau, 1922. Acad. Sci. St. Louis, Trans. 24: 19 (nest, prey). — Reinhard, 1925. Wash. Acad. Sci., Jour. 15: 172-177 (nest, prey transport, egg, life cycle, cocoon, parasite (misdet. as *Pachyophthalmus signatus* Meig.)). — Reinhard, 1929. The witchery of wasps, pp. 235-260, 3 figs. (nest, prey transport, life cycle, cocoon, parasite (misdet. as *Pachyophthalmus signatus* Meig.)). — Krombein, 1953 (1952). Wasmann Jour. Biol. 10: 286 (nest, prey). — Krombein, 1959. Ent. Soc. Wash., Proc. 61: 196 (nest, prey, egg, life cycle). — Evans, 1966. Compar. ethology and evolution of sand wasps, pp. 49-53, fig. 37 (nest, prey).

**costalis pygidialis** (Fox). Western U. S. in U. and L. Sonor. Zones; Mexico. Prey: *Ceresa* sp.

*Gorytes pygidialis* Fox, 1896 (1895). Acad. Nat. Sci. Phila., Proc. 47: 528. ♀, ♂.

Biology: Mickel, 1918 (1917). Nebr. Univ. Studies 17: 36 (prey).

**dentatus** (Fox). N. Mex., Ariz., Calif.

*Gorytes dentatus* Fox, 1893. Canad. Ent. 25: 116. ♂.

**denticulatus denticulatus** (Packard). Widely distributed in North America including Mexico.

Ecology: Nests in sand. Prey: *Deltocephalinae* sp. nymph. Another subsp. occurs in Central and South America.

*Gorytes denticulatus* Packard, 1867. Ent. Soc. Phila., Proc. 6: 430. ♀.

*Gorytes barbatulus* Handlirsch, 1888. Akad. Wiss. Wien, Math.-Nat. Kl., Sitzber. 97: 408. ♂.

Biology: Krombein, 1959. Ent. Soc. Wash., Proc. 61: 196 (prey, nest).

**diversus** (Fox). Calif.

*Gorytes diversus* Fox, 1896 (1895). Acad. Nat. Sci. Phila., Proc. 47: 527. ♀, ♂.

**floricidus** Bohart. Fla.

*Hoplisoides floricidus* Bohart, 1968. Ent. Soc. Wash., Proc. 70: 289. ♂, ♀.

**glabratus** Bohart. Ariz., N. Mex., Colo., Tex. Ecology: Nests in sandy soil, stores as many as 98 prey per cell. Prey: *Aceratagallia uhleri* (Van D.), mostly nymphs and a few adults.

*Hoplisoides glabratus* Bohart, 1968. Ent. Soc. Wash., Proc. 70: 291. ♂, ♀.

Biology: Bohart and Menke, 1976. Sphecids wasps of world, p. 520 (nest, prey, egg).

**hamatus** (Handlirsch). Western North America. Ecology: Nests, sometimes gregariously, in soil varying from heavy clay-loam, to sandy clay to sand, makes 1 cell per nest, stores 7-14 prey per cell. Parasite: *Senotainia trilineata* (Wulp)?, *S. rubriventris* Macq?; *Nysson rusticus* Cr., *Epinysson moestus* (Cr.), *E. pumilis* (Cr.)? Prey: *Stictiocephala*? sp., *Ceresini* sp. probably *Stictiocephala* sp., *Telamonini* sp., *Membracidae* sp.; preys upon nymphs only.

*Gorytes hamatus* Handlirsch, 1888. Akad. Wiss. Wien, Math.-Nat. Kl., Sitzber. 97: 403. ♂.

*Gorytes spilographus* Handlirsch, 1895. Akad. Wiss. Wien, Math.-Nat. Kl., Sitzber. 104: 895. ♀.

*Hoplisoides arizonensis* Baker, 1907. Invertebrata Pacifica 1: 164. ♀.

*Gorytes (Hoplisoides) adornata* Bradley, 1920. Amer. Ent. Soc., Trans. 46: 115. ♀.

Taxonomy: Evans, 1959. Amer. Ent. Soc., Trans. 85: 151-152, fig. 40 (larva).

Biology: Powell and Chemsak, 1959. Pan-Pacific Ent. 35: 195-201 (nest, prey transport, egg, parasites?). — Evans, 1966. Compar. ethology and evolution of sand wasps, pp. 46-49 (nest,



- prey). — Evans, 1970. Mus. Compar. Zool., Bul. 140: 494 (nest, prey, parasites). — Bohart and Menke, 1976. Sphecid wasps of world, p. 520 (parasite).
- placidus birkmanni** Baker. Southwestern U. S.  
*Hoplisoides Birkmanni* Baker, 1907. Invertebrata Pacifica 1: 166. ♀.  
*Hoplisoides pruinosis* Baker, 1907. Invertebrata Pacifica 1: 166. ♀.
- placidus nebulosus** (Packard). Eastern U. S. Ecology: Nests in sand, makes 1-3 cells per nest, stores 4-20 prey per cell. Parasite: *Senotainia trilineata* (Wulp)?; *Dasymutilla v. vesta* (Cr.)?; *Nysson opulentus* Gerst.?, *N. tuberculatus* Handl., *N. daeckei* Vier. Prey: *Microcentrus* spp., *Palonica virida* Ball, *P. sp.*, *Ceresa palmeri* Van D., *Ceresini* spp., *Campylenchia latipes* Say, *Enchenopa binotata* Say, *Entylia concisa* Wlkr., *E. sinuata* F., *Publilia concava* Say, *Spissistilus festinus* Say, *Telamona decorata* Ball, *Tylopelta brevis* Van D., *Vanduzee arcuata* (Say), *V. triguttata* Burm.; both adults and nymphs are used.  
*Gorytes nebulosus* Packard, 1867. Ent. Soc. Phila., Proc. 6: 424. ♀.  
*Gorytes armatus* Provancher, 1887. Addit. Corr. Faune Ent. Canada Hym., p. 272. "♀" = ♂.  
*Gorytes microcephalus* Handlirsch, 1888. Akad. Wiss. Wien, Math.-Nat. Kl., Sitzber. 97: 405. ♂.  
*Gorytes Pergande* Handlirsch, 1888. Akad. Wiss. Wien, Math.-Nat. Kl., Sitzber. 97: 407. ♂.  
*Philanthus Harringtonii* Provancher, 1888. Addit. Corr. Faune Ent. Canada Hym., p. 278.  
Taxonomy: Evans and Lin, 1956. Amer. Ent. Soc., Trans. 82: 45, figs. 43, 44 (larva).  
Biology: Pate, 1946. Brooklyn Ent. Soc., Bul. 41: 99 (prey). — Krombein, 1953. Wasmann Jour. Biol. 10: 286-287 (nest, prey carriage, parasites?). — Krombein, 1959. Ent. Soc. Wash., Proc. 61: 196 (prey, nest). — Evans, 1966. Compar. ethology and evolution of sand wasps, pp. 34-46, figs. 28-33, 35 (nest, prey, life cycle, cocoon, parasites). — Bohart and Menke, 1976. Sphecid wasps of world, p. 520 (nest, prey).
- placidus placidus** (Smith). Fla.  
*Gorytes placidus* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 368. ♀, ♂.  
*Gorytes rufipes* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 369. ♀.
- projectus** Bohart. Calif. (San Joaquin Valley).  
*Hoplisoides projectus* Bohart, 1968. Ent. Soc. Wash., Proc. 70: 290. ♂, ♀.
- punctifrons** (Cameron). Western U. S.; Mexico (Sinaloa).  
*Gorytes punctifrons* Cameron, 1890. Biol. Cent.-Amer., Hym., v. 2, p. 74, pl. 5, figs. 13, 13a. ♀.  
*Gorytes gulielmi* Viereck, 1907. Amer. Ent. Soc., Trans. 33: 408. ♀.
- semipunctatus** (Taschenberg). Southern U. S.; Argentina. Probably adventive in U. S.  
*Hoplisus semipunctatus* Taschenberg, 1875. Ztschr. Gesell. Naturwiss. Berlin 45: 367. ♀.
- spilopterus** (Handlirsch). Western U. S. Ecology: Nests in damp sand. Prey: *Stictocephala wickhami* Van D., *Spissistylus festinus* (Say), *Campylenchia latipes* (Say); preys upon adults and nymphs.  
*Gorytes spilopterus* Handlirsch, 1888. Akad. Wiss. Wien, Math.-Nat. Kl., Sitzber. 97: 414. ♀.  
*Gorytes maculatus* Provancher, 1895. Nat. Canad. 22: 140. ♀.  
*Gorytes (Hoplisoides) pogonodes* Bradley, 1920. Amer. Ent. Soc., Trans. 46: 114. ♂.  
Biology: Pate, 1946. Brooklyn Ent. Soc., Bul. 41: 99 (prey). — Evans, 1966. Compar. ethology and evolution of sand wasps, pp. 55-56 (nest, prey).
- splendidulus** (Bradley). Western U. S.  
*Gorytes (Hoplisoides) splendidula* Bradley, 1920. Amer. Ent. Soc., Trans. 46: 113. ♀, ♂.
- tricolor** (Cresson). Widely distributed in U. S.; Mexico (Sinaloa). Ecology: Nests in aggregations in sand, makes 2-4 cells per nest, stores 7-19 prey per cell. Parasite: *Nysson bellus* Cr.? Prey: *Parabolocratus brumeus* Ball, adult females and a few nymphs.  
*Gorytes tricolor* Cresson, 1868. Amer. Ent. Soc., Trans. 1: 380. "♀" = ♂.  
*Gorytes (Hoplisus) helianthi* Rohwer, 1911. U. S. Natl. Mus., Proc. 40: 569 ♀.  
*Hoplisus rufocaudatus* Mickel, 1916. Amer. Ent. Soc., Trans. 42: 401. ♂.

Biology: Evans, Lin and Yoshimoto, 1954. Ent. News 65: 5-11 (nest, prey transport, parasite ?).

#### SUBFAMILY STIZINAE

All species nest in the ground.

Revision: Handlirsch, 1892. Akad. Wiss. Wien, Math.-Nat. Kl., Sitzber. 101: 25-181, 3 pls. (spp. of world). — Fox, 1896 (1895). Acad. Nat. Sci. Phila., Proc. 47: 266-268 (N. Amer. spp.). — Parker, 1929. U. S. Natl. Mus., Proc. 75 (5): 7-11, figs. 1-6 (N. Amer. genera).

#### Genus STIZUS Latreille

*Stizus* Latreille, 1802-1803. Hist. Nat. Crust. Ins., v. 3, p. 344.

Type-species: *Stizus ruficornis* Fabricius. Desig. by Blanchard, 1846 (= *Larra ruficornis* Fabricius).

*Megastizus* Patton, 1879. U. S. Geol. Geog. Survey, Bul. 5: 344.

Type-species: *Stizus brevipennis* Walsh. Orig. desig.

*Stizolarra* Saussure, 1887. Soc. Ent. 2: 9.

Type-species: *Sphex vespiformis* Fabricius. Desig. by Pate, 1937.

*Megalostizus* Schulz, 1906. Spolia Hym., p. 199. Emend.

This very large genus occurs in the Holarctic and Ethiopian Regions; it is also present in parts of the Oriental Region, though apparently absent from Southeast Asia. Several species have been reported to prey upon grasshoppers, katydids, and, rarely, mantids.

Revision: Dow, 1941. Psyche 48: 171-181, 7 figs. (N. Amer. spp.).

*brevipennis* Walsh. U. S. east of 100th meridian. Prey: *Conocephalus* sp. adult.

*Stizus brevipennis* Walsh, 1869. Amer. Ent. 1: 162. ♂.

*Larra Brendeli* Taschenberg, 1875. Ztschr. Gesam. Naturw. Halle 45: 361. ♂.

Biology: Williams, 1914 (1913). Kans. Univ. Sci. Bul. 8: 198 (prey).

Morphology: Snodgrass, 1941. Smithsn. Inst., Misc. Collect. 99 (14): pl. 19, figs. A-G (male genitalia).

*iridis* Dow. Utah, Calif. Ecology: Makes a unicellular cell in talus slope, stores at least 8 prey per cell. Prey: *Trimerotropis pallidipennis* (Burm.), *T. sparsa* (Thom.); adults.

*Stizus iridis* Dow, 1942 (1941). Psyche 48: 171. ♂.

*occidentalis* Parker. Calif., Ariz.

*Stizus occidentalis* Parker, 1929. U. S. Natl. Mus., Proc. 75 (5): 9. ♀, ♂.

*texanus* Cresson. Tex., Ariz.; Mexico (Chihuahua).

*Stizus texanus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 222. ♀, ♂.

#### Genus STIZOIDES Guerin

Revision: Gillaspay, 1963. Mus. Compar. Zool., Bul. 128: 369-391, 1 pl. (N. Amer. spp.).

#### Genus STIZOIDES Subgenus STIZOIDES Guerin

*Stizus* subg. *Stizoides* Guerin, 1844. Iconogr. Regn. Anim. 7, Ins., p. 438.

Type-species: *Larra fasciata* Fabricius. Desig. by Parker, 1929.

The typical subgenus does not occur in North America.

#### Genus STIZOIDES Subgenus TACHYSTIZUS Pate

*Tachystizus* Pate, 1937. Amer. Ent. Soc., Mem. 9: 63.

Type-species: *Crabro tridentatus* Fabricius. Orig. desig.

Two species of this subgenus are known to be cleptoparasites of other sphecoid wasps.

*foxi* Gillaspay. Ariz.; Mexico (Baja California).

*Stizoides (Tachystizus) foxi* Gillaspay, 1963. Mus. Compar. Zool., Bul. 128: 378, figs. 1, 2, 5, 7, 9, 11. ♀, ♂.

**renicinctus** (Say). Mich., Wis., Ill. south to Tex., west to Alta., B. C. and Calif., D. C., N. C.;

Mexico (Zacatecas). Host: *Prionyx atratus* (lep.), *P. thomae* (F.).

*Stizus renicinctus* Say, 1823. West. Quart. Rptr. 2: 77.

*Stizus uncinatus* Say, 1824. Amer. Ent. 1: 4. ♂. Emend.

Biology: Bradley, 1908. Ent. Soc. Amer., Ann. 1: 129 (sleeping aggregation). —Williams, 1914 (1913). Kans. Univ. Sci. Bul. 8: 230 (host). —Smith, 1915. U. S. Dept. Agr., Bul. 293: 10-11 (host). —Rau and Rau, 1918. Wasp studies afield, pp. 180-193 (host). —Evans, 1966.

Compar. ethology and evolution of sand wasps, p. 129 (host).

### Genus BEMBEVINUS Costa

*Bembecinus* Costa, 1859. Fauna Regn. Napoli, Imen. Acul., Nyssonid., p. 4.

Type-species: *Bembecinus meridionalis* Costa. Monotypic.

*Stizomorphus* Costa, 1859. Fauna Regn. Napoli, Imen. Acul., Nyssonid., p. 7.

Type-species: *Vespa tridens* Fabricius. Monotypic.

*Gorystizus* Pate, 1937. Amer. Ent. Soc., Mem. 9: 29.

Type-species: *Vespa tridens* Fabricius. Orig. desig.

*Lavia* Rayment, 1953. Victorian Nat. 70: 123. Nom. nudum.

The genus occurs in all major zoogeographic regions and on many islands. Five species groups are recognized but the few North American taxa are all assigned to the Tridens Group. Many species nest in sandy soil in compact colonies, frequently made up of many individuals. All species whose biology is known prey upon leafhoppers and some other Homoptera, and practice progressive provisioning.

Revision: Krombein and Willink, 1951 (1950). Amer. Midland Nat. 44: 699-713 (N. Amer. spp.).

Biology: Evans, 1955. Behaviour 7: 295-302 (comparative behavior).

**bishoppi** Krombein and Willink. Tex.

*Bembecinus bishoppi* Krombein and Willink, 1951 (1950). Amer. Midland Nat. 44: 710. ♀, ♂.

**moneduloides** (Smith). Fla. (St. Johns Bluff).

*Larra moneduloides* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 346. ♀, (♂ misdet.).

Taxonomy: Willink, 1957. Ann. and Mag. Nat. Hist. (12) 9: 702-704.

**nanus floridanus** Krombein and Willink. S. Fla.

*Bembecinus nanus floridanus* Krombein and Willink, 1951 (1950). Amer. Midland Nat. 44: 706. ♂.

**nanus nanus** (Handlirsch). N. J. to north. Fla., west to Tex., Iowa, east. Nebr. Prey:

*Graphocephala versula* (Say), Fulgoridae spp.

*Stizus nanus* Handlirsch, 1892. Akad. Wiss. Wien, Math.-Nat. Kl., Sitzber. 101: 61. ♀, ♂.

Biology: Shappirio, 1946. Ent. News 57: 229-230 (prey).

**nanus strenuus** (Mickel). Nebr., S. Dak., Wyo., Tex.

*Stizus strenuus* Mickel, 1918 (1917). Nebr. Univ. Studies 17: 331. ♀, ♂.

**neglectus** (Cresson). Nebr., Kans., Tex., La., Miss. Ecology: Colony nests in hard-packed sand containing pebbles, makes 1-2 cells per nest, stores 10-15 prey per cell, practices progressive provisioning. Prey: *Gyponana octolineata* (Say), *Texananus excultus* (Uhl.), *Xerophloea majesta* Laws., all adults; *Scolops* sp. nymphs; preys principally upon adult Cicadellidae.

*Monedula neglecta* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 222. ♀.

*Stizus xanthochrous* Handlirsch, 1892. Akad. Wiss. Wien, Math.-Nat. Kl., Sitzber. 101: 69. ♂.

Taxonomy: Evans and Lin, 1956. Amer. Ent. Soc., Trans. 82: 47, figs. 37-42 (larva).

Biology: Evans, 1955. Behaviour 7: 287-295, 4 figs. (mating, nest, prey, egg, cocoon, life cycle).

**quinquespinosus** (Say). Nebr., Colo. and south. Calif. to Panama. Ecology: Nests in large colonies in sand, makes unicellular nest. Prey: *Ciminius hartii* (Ball), *Stirellus bicolor* (Van D.), *Exitanus* sp., *Cuerna lateralis* (F.), *C.* sp., *Draeculacephala noveboracensis* (Fitch), *Carnocephala sagittifera* (Uhl.), *Acinopterus angulatus* Laws., Cicadellidae sp.; adults and a few nymphs.

*Nyssus 5-spinosus* Say, 1823. West. Quart. Rptr. 2: 78.

*Stizus godmani* Cameron, 1890. Biol. Cent.-Amer., Hym., v. 2, pl. 5, fig. 8. ♀, ♂.

*Stizus lineatus* Cameron, 1890. Biol. Cent.-Amer., Hym., v. 2, p. 102. ♂.

*Stizus flavus* Cameron, 1890. Biol. Cent.-Amer., Hym., v. 2, p. 103. ♂.

*Stizus flavus* var. *subalpinus* Cockerell, 1898. Davenport Acad. Nat. Sci., Proc. 7: 142. ♂.

*Nyssus cressoni* Cameron, 1904. Amer. Ent. Soc., Trans. 30: 95. ♀.

Taxonomy: Willink, 1957. Ann. and Mag. Nat. Hist. (12) 9: 702-704. — Evans, 1959. Amer. Ent. Soc., Trans. 85: 152-153, figs. 71-73 (larva).

Biology: Rohwer, 1909. Colo. Univ. Studies 6: 246-247 (colony; prey misd.). — Rodeck, 1931. Colo.-Wyo. Acad. Sci., Jour. 1: 61 (prey, nest). — Strandtmann, 1945. Ent. Soc. Amer., Ann. 38: 312-313 (nest, prey transport). — Evans, 1966. Compar. ethology and evolution of sand wasps, pp. 134-141, fig. 76 (nest, prey). — Evans, 1968. Ent. Soc. Amer., Ann. 61: 1344 (prey).

**wheeleri** Krombein and Willink. Ariz.

*Bembecinus wheeleri* Krombein and Willink, 1951 (1950). Amer. Midland Nat. 44: 709. ♀, ♂.

#### SUBFAMILY BEMBICINAE

All species nest in the ground, usually in quite friable soil. The more primitive species are solitary nesters, practice mass provisioning and prey upon Hemimetabola, whereas the more specialized species nest in large aggregations, have developed progressive provisioning behavior independently in some genera and prey largely upon advanced Holometabola.

This subfamily has undergone considerable evolution in the New World where a number of genera occur. *Bembix* is the only genus of worldwide distribution and it occurs in all major zoogeographic regions.

Revision: Parker, 1917. U. S. Natl. Mus., Proc. 52: 1-155. — Parker, 1929. U. S. Natl. Mus. Proc. 75 (5): 11-181.

Taxonomy: Bohart and Horning, 1971. Calif. Ins. Survey, Bul. 13: 1-49, 74 figs., 18 maps (Calif. spp.).

#### Genus BICYRTES Lepeletier

*Bicyrtes* Lepeletier, 1845. Hist. Nat. Ins., Hym., v. 3, p. 53.

Type-species: *Bicyrtes Servillii* Lepeletier. Monotypic.

*Bembidula* Burmeister, 1874. Acad. Nac. Cien. Cordoba, Bol. 1: 122.

Type-species: *Monedula discisa* Taschenberg. Desig. by Parker, 1917.

*Dumonella* Reed, 1894. Univ. Chile, An. 85: 608.

Type-species: *Monedula sericea* Spinola. Orig. desig.

Wasps of this genus make uni- or multicellular nests, usually in fine- to coarse-grained sand. They prey upon Heteroptera, chiefly Pentatomidae and Coreidae, although Pyrrhocoridae, Scutelleridae, Cydnidae, Lygaeidae and Reduviidae may be used occasionally; nymphs are preferred to adults. The egg is laid on the first bug placed in the cell.

affinis (Cameron). South. Ariz.; Mexico (Guerrero).

*Bembidula affinis* Cameron, 1897. Ann. and Mag. Nat. Hist. (6) 19: 371. ♀.

**capnoptera** (Handlirsch). Ga., Fla., La., Tex., Kans., N. Mex., Ariz., Calif.; Mexico (Baja

California). Ecology: Nests in soil, stores 5-7 prey per cell. Prey: *Thyanta pallidivirens* accerra (McAtee) nymphs and adults.

*Bembidula capnoptera* Handlirsch, 1889. Akad. Wiss. Wien, Math.-Nat. Kl., Sitzber. 98: 497. ♂, ♀.

*Bembidula capnoptera* var. *mesillensis* Cockerell, 1898. Davenport Acad. Nat. Sci., Proc. 7: 142. ♂.

*Bicyrtes annulata* Parker, 1917. U. S. Natl. Mus., Proc. 52: 67. ♂, ♀.

*Bicyrtes tristis* Fox, 1923. Calif. Acad. Sci., Proc. (4) 12: 435. ♂.

Biology: Linsley, 1962. Ent. Soc. Amer., Ann. 55: 157-158, fig. 5 (sleeping aggregation).

—Evans, 1966. Compar. ethology and evolution of sand wasps, pp. 171-172 (nest, prey).

**fodiens** (Handlirsch). Southeast. to southwest. U. S.; Mexico, Central America. Ecology: Nests in fine sand or sandy clay, makes 4-5 cells per completed nest and stores 10-23 prey per cell. Parasite: *Metopia argyrocephala* (Meig.); *Holopyga ventralis* (Say). Prey: *Solubea pugnax* F. adults, *Mormidea lugens* (F.) adults; *Homaemus aeneifrons* Say nymphs.

*Bembidula fodiens* Handlirsch, 1889. Akad. Wiss. Wien, Math.-Nat. Kl., Sitzber. 98: 499. ♂, ♀.

*Bembidula Burmeisteri* Handlirsch, 1889. Akad. Wiss. Wien, Math.-Nat. Kl., Sitzber. 98: 500. ♀.

Taxonomy: Evans and Lin, 1956. Amer. Ent. Soc., Trans. 82: 50, figs. 53-55 (larva).

Biology: Rau, 1922. St. Louis Acad. Sci., Trans. 24 (7): 28 (nest). —Evans, 1966. Compar. ethology and evolution of sand wasps, pp. 167-170, 173 (nest, prey transport, egg, cocoon, life cycle, parasites).

**insidiatrix** (Handlirsch). Mass., N. J., Fla., Ky., Tex., N. Mex.

*Bembidula insidiatrix* Handlirsch, 1889. Akad. Wiss. Wien, Math.-Nat. Kl., Sitzber. 98: 494. ♂, ♀.

**quadrifasciata** (Say). U. S. east of Rocky Mts. in Transit. and Austr. Zones. Ecology: Nests in sand or heavier soil, usually makes a unicellular nest but occasionally one with 2-3 cells, stores 4-14 prey per cell. Parasite: *Senotainia rubriventris* Macq., *S. trilineata* (Wulp), *S. vigilans* Allen, S. sp.; *Holopyga ventralis* (Say). Prey: *Aptomerus* sp., *Zelus* sp.; *Lygaeidae* sp.; *Acanthocephala femorata* (F.), *Anasa tristis* (DeG.), *Archimerus alternatus* (Say), *A. calcarator* (F.), *Chariestrus antennator* (F.), *Leptoglossus clypealis* Heid., *L. oppositus* Say, *L. phyllopus* (L.); *Acrosternum hilare* (Say), *A. sp.*, *Banasa dimidiata* (Say), *Brochymena arborea* Say, *B. cariosa* Stal, *B. carolinensis* Westw., *B. quadripustulata* (F.), *Chlorochroa uhleri* Stal, *Dendrocoris humeralis* Uhl., *Edessa florida* Barb., *Euschistus tristigmus* Say, *E. spp.*, *Menecles incertus* Say, *Murgantia histrionica* Hahn, *Nezara viridula* (L.), *N. sp.*, *Podisus* sp., *Stethaulax marmoratus* Say, *Thyanta custator* F., *T. sp.*; *Homaemus aeneifrons* Say, *Tetyra bipunctata* H.-S.; *Cyrtomenus* sp.; Pentatomidae and Coreidae are preferred prey and only nymphs are used.

*Monedula quadrifasciata* Say, 1824. In Keating, Narr. Long's 2nd Exped., v. 2, app., p. 336. ♂, ♀.

*Monedula sallei* Guérin, 1844. Iconogr. Regne Anim., v. 7, p. 437.

Taxonomy: Evans and Lin, 1956. Amer. Ent. Soc., Trans. 82: 49, figs. 45-52 (larva). —Evans, 1964. Amer. Ent. Soc., Trans. 90: 265 (larva).

Biology: Hartman, 1905. Tex. Univ., Bul. 65: 32-36, fig. 14 (nest, prey, parasites). —Parker, 1917. U. S. Natl. Mus., Proc. 52: 134 (nest, prey). —Rau and Rau, 1918. Wasp studies afield, pp. 41-43 (nest, prey). —Smith, 1923. Ent. Soc. Amer., Ann. 16: 238-246 (nest, prey, parasite). —Davis, 1926. N. Y. Ent. Soc., Jour. 34: 89-90 (nest, prey). —Rau, 1934. Canad. Ent. 66: 260 (prey transport). —Krombein, 1953 (1952). Wasmann Jour. Biol. 10: 287-288 (nest, prey). —Krombein, 1955. Ent. Soc. Wash., Proc. 57: 152-157, 4 figs. (nest, prey transport, egg, cocoon, life cycle, parasite). —Krombein, 1958. Ent. Soc. Wash., Proc. 60: 105-106 (nest, prey). —Krombein, 1959. Ent. Soc. Wash., Proc. 61: 196 (nest, prey). —Evans, 1966. Compar. ethology and evolution of sand wasps, pp. 146-160, figs. 80-90 (nest, mating, prey transport, life cycle, egg, cocoon, parasites). —Kurczewski and Kurczewski, 1971. Kans. Ent. Soc., Jour. 44: 336 (prey).

**variegata** (Olivier). Tex.; Mexico to Argentina, West Indies.

*Bembex variegata* Olivier, 1789. Encycl. Meth., Ins., v. 4, p. 292.

*Monedula sericea* Spinola, 1851. In Gay, Hist. Fis. Pol. Chile, Zool., v. 6, p. 315.

*Bembex guiana* Cameron, 1912. Timehri (3) 2: 431. ♀.

**ventralis** (Say). South. Canada, U. S.; north. Mexico. Ecology: Nests in sand or sandy gravel, sometimes in small aggregations, usually makes a unicellular cell but occasionally one with 2-3 cells, stores 3-18 prey per cell. Parasite: *Senotainia vigilans* Allen, *S. trilineata* (Wulp). Prey: *Anasa tristis* (DeG.); *Banasa dimidiata* Say, *Cosmopepla bimaculata* Thom., *Elasmotethus cruciatus* Say, *Euschistus euschistoides* Voll., *E. tristigmus* Say, *E. variolarius* Beauv., *Meneles incertus* Say, *Mormidia lugens* F., *Thyanta pallidovirens accerra* McAtee, *Trichoepela semivittata* Say; only nymphs are used and Pentatomidae are the preferred prey.

*Monedula ventralis* Say, 1824. In Keating, Narr. Long's 2nd Exped. v. 2, app., p. 337. ♂.

*Bicyrtes Servillii* Lepeletier, 1845. Hist. Nat. Ins., Hym., v. 3, p. 53. ♀.

*Monedula parata* Provancher, 1888. Addit. Corr. Faune Ent. Canada Hym., p. 416. ♀.

*Bembidula meliloti* Rohwer, 1908. Ent. News 19: 376. ♂.

Taxonomy: Evans and Lin, 1956. Amer. Ent. Soc., Trans. 82: 50, figs. 56-58 (larva).

Biology: Hartman, 1905. Tex. Univ., Bul. 65: 36-39 (nest, prey). —Parker, 1917. U. S. Natl. Mus., Proc. 52: 132-133 (nest, prey, life cycle). —Evans, 1966. Compar. ethology and evolution of sand wasps, pp. 160-167, figs. 91-93 (nest, prey transport, egg, life cycle).

Morphology: Snodgrass, 1941. Smithsn. Inst., Misc. Collect. 99 (14): pl. 19, figs. I-L (male genitalia).

**viduata** (Handlirsch). Utah, Ariz., Tex.; north. Mexico. Ecology: Nests in coarse gravel. Prey: Coreidae nymphs.

*Bembidula viduata* Handlirsch, 1889. Akad. Wiss. Wien, Math.-Nat. Kl., Sitzber. 98: 491. ♀.

*Bicyrtes gracilis* Parker, 1917. U. S. Natl. Mus., Proc. 52: 68. ♂.

Biology: Alcock and Gamboa, 1975. Ariz. Acad. Sci., Jour. 10: 160 (nest, prey).

### Genus MICROBEMBEX Patton

*Microbembex* Patton, 1879. U. S. Geol. and Geog. Survey, Bul. 5: 364.

Type-species: *Bembex monodonta* Say. Orig. desig.

The North American species are scavengers, bringing in as food for their larvae a wide variety of dead arthropods. Two South American species have been reported as paralyzing live beetles and other insects, but these observations need confirmation. The egg is laid in the empty cell and progressive provisioning is practiced.

**argyropleura** Bohart. South. Calif., Ariz., Nev., Utah; Mexico (Baja California). Ecology: Nests in dense aggregations in sand dune blowouts, lays egg in empty cell, practices progressive provisioning. Parasite: *Senotainia* sp. near *rufiventris* (Coq.)? Prey: Dead arthropods including Diptera, Hymenoptera, Coleoptera, Heteroptera, Araneae.

*Microbembex argyropleura* Bohart, 1970. Pan-Pacific Ent. 46: 203. ♂, ♀.

Biology: Alcock, 1975. Southwest. Nat. 20: 337-339, figs. 1, 2 (nest, prey, parasite).

**aurata** Parker. West. Tex. to south. Calif.

*Microbembex aurata* Parker, 1917. U. S. Natl. Mus., Proc. 52: 121. ♂, ♀.

Taxonomy: Gillaspay, 1963. Proc. Ent. Soc. Wash. 65: 230.

**californica** Bohart. Cent. Calif. to Wyo., Utah and N. Mex.; Mexico (Baja California). Prey: Dead arthropods.

*Microbembex californica* Bohart, 1970. Pan-Pacific Ent. 46: 202. ♂, ♀.

Biology: Goodman, 1970. Pan-Pacific Ent. 46: 207-209 (nest, "prey").

**hirsuta** Parker. N. Mex., Tex.

*Microbembex hirsuta* Parker, 1917. U. S. Natl. Mus., Proc. 52: 122. ♂, ♀.

**monodonta** (Say). South. Canada and U. S. east of Rocky Mts.; Mexico, Central America.

Ecology: Nests in large aggregations in loose dry to moist firm sand, makes a unicellular nest, places egg upright in empty cell, practices progressive provisioning. Parasite: *Senotainia trilineata* (Wulp), *S. rufiventris* (Coq.)?, *Exoprosopa fascipennis* (Say); *Dasymutilla bioculata* (Cr.), *D. sp.*; *Parnopes f. fulvicornis* Cam.?, *P. f. atlanticus* Krom.? Prey: Dead arthropods belonging to Phalangida, Araneida, Ephemeroptera,

Orthoptera, Psocoptera, Hemiptera, Neuroptera, Trichoptera, Lepidoptera, Coleoptera, Diptera, Hymenoptera; live paralyzed prey of other wasps may be stolen. Predator: Small red ants.

*Bembex monodonta* Say, 1824. In Keating, Narr. Long's 2nd. Exped., v. 2, app., p. 335. ♂.

*Microbembex monodonta occidentalis* Johnson and Rohwer, 1908. Ent. News 19: 375.

*Microbembex tarsalis* Rohwer, 1914. U. S. Natl. Mus., Proc. 47: 516. ♂, ♀.

Taxonomy: Evans and Lin, 1956. Amer. Ent. Soc., Trans. 82: 55, figs. 79-84 (larva). — Evans, 1964. Amer. Ent. Soc., Trans. 90: 266 (larva).

Biology: Hartman, 1905. Tex. Univ., Bul. 65: 21-26 (nest, prey). — Parker, 1917. U. S. Natl. Mus., Proc. 52: 134-141 (mating, nest, prey, life cycle, cocoon, parasite, predator). — Stoehr, 1917. Nat. Canad. 43: 113-119 (mating, nest, prey). — Rau and Rau, 1918. Wasp studies afield, pp. 39-41, fig. 7 (nest, prey). — Mickel, 1924. Ent. News 35: 236-242 (parasite). — Krombein, 1953 (1952). Wasmann Jour. Biol. 10: 288 (prey, life cycle). — Krombein, 1958. Amer. Ent. Soc., Trans. 84: 166 (parasite ?). — Evans, 1966. Compar. ethology and evolution of sand wasps, pp. 361-388, figs. 177-190 (sleeping burrows, nest, prey, egg, life cycle, parasites ?).

Morphology: Snodgrass, 1941. Smiths. Inst., Misc. Collect. 99 (14): pl. 19, figs. H, Q, R, pl. 20, figs. A, B (male genitalia).

**nigrifrons** (Provancher). U. S. and Mexico west of 100th meridian. Ecology: Nests in sand.

Parasite: *Dasyneutilla cassandra* Mick., *D. gloriosa* (Sauss.); *Parnopes f. fulvicornis* Cam. Prey: Many kinds of dead arthropods.

*Bembex nigrifrons* Provancher, 1888. Addit. Corr. Faune Ent. Canada Hym., p. 415. ♂, ♀.

*Microbembex monodonta neomexicana* Johnson and Rohwer, 1908. Ent. News 19: 375.

*Microbembex monodonta deltaensis* Johnson and Rohwer, 1908. Ent. News 19: 375. ♂.

Biology: Bohart and MacSwain, 1940. Pan-Pacific Ent. 16: 92-93 (parasite; misdet. as *aurata* Prkr.). — Alcock and Ryan, 1973. Pan-Pacific Ent. 49: 144-148, 1 fig. (prey, mating behavior). — Alcock and Gamboa, 1975. Ariz. Acad. Sci., Jour. 10: 161-162 (nesting behavior).

**rufiventris** Bohart. Calif.

*Microbembex rufiventris* Bohart, 1970. Pan-Pacific Ent. 46: 204. ♂, ♀.

### Genus STICTIA Illiger

*Monedula* Latreille, 1802-1803. Hist. Nat. Crust. Ins., v. 3, p. 345. Preocc.

Type-species: *Vespa signata* Linnaeus. Desig. by Latreille, 1810.

*Stictia* Illiger, 1807. In Rossi, Fauna Etrusca, Ed. 2, v. 2, p. 131. N. name for *Monedula* Latreille.

These wasps occur only in the New World where most species are restricted to the tropical areas. They occasionally nest in large aggregations in sandy soil. The nest is unicellular. They practice progressive provisioning and prefer horseflies (Tabanidae) as prey. The egg is placed in the empty cell in *carolina* (F.) and on the first fly brought into the cell in our other species.

**carolina** (Fabricius). N. J. and Pa. south to Fla., west to Ill., Kans., and N. Mex. Ecology:

Occasionally nests in very large aggregations in sand; the egg is placed in the empty cell; as many as 63 prey may be supplied. Parasite: *Senotainia trilineata*

(Wulp), *Miltogrammini* spp.; *Dohrniphora cornuta* (Big.). Prey: *Psorophora ciliata* (F.);

*Chrysops dimmocki* Hine, *Chlorotabanus crepuscularis* Beq., *Hybomitra hinei wrighti*

Whit., *Tabanus abdominalis* F., *T. americanus* Forst., *T. atratus* F., *T. a. var.*

*nantuckensis* Hine, *T. bishoppi* Stone, *T. cheliopertus* Rond., *T. coarctatus* Stone, *T.*

*endymion* O. S., *T. fumipennis* Wied., *T. i. imitans* Wlkr., *T. lineola* F., *T. melanocerus*

*lacustris* Stone, *T. mularis* Stone, *T. nigripes* Wied., *T. nigrescens* Beauv., *T. petiolatus*

Hine, *T. sparus* Whit., *T. stygius* Say, *T. sulcifrons* Macq., *T. trijunctus* Wlkr., *T. vittiger*

*schwardti* Phil., *T. spp.*; *Odontomyia cincta* Oliv.; *Volucella mexicana* Macq., *V. nigra*

Greene; *Graphomya maculata* Scop., *Musca domestica* L., *Orthellia caesarion* Meig.,

*Stomoxys calcitrans* L.; *Amobia erythrura* (Wulp), *Sarcophaga bullata* Prkr., *S.*

*ochracea* Ald., *S. sarrazenioides* Ald., *S. spp.*; *Calliphora vomitoria* L., *Cochliomyia*

*macellaria* F.; Tachinidae spp.; *Melampsalta calliope* (Wlkr.); *Atalopedes campestris* Boisd.; the last two prey species (cicada and skipper) were stored only in a large aggregation where there was considerable competition for prey. Predator: *Solenopsis geminata* F. This wasp is commonly called the "horse guard" because it preys so commonly on horseflies.

*Bembex carolina* Fabricius, 1793. Ent. System., v. 2, p. 249.

Taxonomy: Evans and Lin, 1956. Amer. Ent. Soc., Trans. 82: 53, figs. 72-78 (larva). — Evans, 1964. Amer. Ent. Soc., Trans. 90: 268, fig. 55 (larva).

Biology: Bryant, 1870. Amer. Ent. 2: 87 (prey capture). — Ashmead, 1894. Psyche 7: 61 (prey capture). — Hartman, 1905. Tex. Univ., Bul. 65: 27-29, figs. 7, 15 (nest, prey capture, egg, life cycle, cocoon). — Hine, 1906. La. State Crop Pest Comn. Cir. 6: 20-27 (nest, prey). — Hine, 1907. La. Agr. Expt. Sta., Bul. 93: 13-15 (nest, prey). — Krombein, 1958. Ent. Soc. Wash., Proc. 60: 106-107 (nest, prey, parasite). — Krombein, 1959. Ent. Soc. Wash., Proc. 61: 196-197 (nest, prey, life cycle, cocoon). — Evans, 1966. Compar. ethology and evolution of sand wasps, pp. 223-243, figs. 119-133 (mating, nest, egg, prey capture and transport, life cycle, parasites). — Lin, 1971. Tex. Jour. Sci. 23: 275-283, 3 figs. (mating, nest, egg, prey, life cycle, cocoon).

*signata signata* (Linnaeus). South. Fla., south. Calif.; West Indies, tropical Mexico, Central and South America. Ecology: Nests in large aggregations in sand along coasts and rivers; the egg is placed on the first fly brought into the cell. Parasite: *Villa* sp.? Prey: *Tabanus truquii* Bell., *T. sp.*, *Diachlorus curvipes* (F.), *Lepiselaga crassipes* F., *Chrysops costatus* F.; *Hedriodiscus dorsalis* (F.); *Allograpta* sp., *Eristalis* sp., *Volucella* sp.; *Musca domestica* L., *Morellia scapulata* (Big.); *Cochliomyia macellaria* (F.), *Phaenicia cluvia* (Wlkr.); *Sitophaga* sp., Tachinidae sp.; *Sarcophaga* spp.; Tabanidae are the preferred prey. Another subsp. occurs in Peru.

*Vespa signata* Linnaeus, 1758. Syst. Nat., Ed. 10, v. 1, p. 574.

*Apis vespiiformis* DeGeer, 1773. Mem. Hist. Ins., v. 3, p. 570, pl. 28, figs. 3, 4.

*Monedula insularis* Dahlbom, 1845. Hym. Europaea, v. 1, pp. 186, 494. ♀.

Biology: Evans, 1966. Compar. ethology and evolution of sand wasps, pp. 243-247 (nest, prey, egg, scavengers).

*vida* (Handlirsch). Tex. (Cameron Co.); Mexico (Tamaulipas, Veracruz, Yucatan). Ecology: Nests in hard-packed beach sand in small aggregations; the egg is placed on the first fly brought into the cell. Parasite: *Miltogrammini* sp. Prey: *Tabanus texanus* Hine, *T. s. schwardti* Phil., *T. vittiger guatemalensis* Hine, *T. spp.*, *Leucotabanus itzarum* Beq.; *Cochliomyia macellaria* (F.); *Sarcophaga effrenata* Wlkr.

*Monedula vida* Handlirsch, 1890. Akad. Wiss. Wien, Math.-Nat. Kl., Sitzber. 99: 101. ♀.

Taxonomy: Evans, 1957. Ent. News 68: 77. ♂. — Evans, 1959. Amer. Ent. Soc., Trans. 85: 153 (larva). — Evans, 1964. Amer. Ent. Soc., Trans. 90: 268-269 (larva).

Biology: Evans, 1957. Ent. News 68: 76-77 (nest, prey transport). — Evans, 1966. Compar. ethology and evolution of sand wasps, pp. 247-252, figs. 134-137 (male territoriality, nest, prey, egg, parasite).

### Genus BEMBIX Fabricius

*Bembix* Fabricius, 1775. Systema Ent., Char. Gen., p. xxiii. No species.

Type-species: *Bembex rostrata* of Fabricius. Desig. by Latreille, 1810.

*Bembix* Fabricius, 1775. Systema Ent., p. 361. Lapsus.

*Bembex* Fabricius, 1776. Gen. Ins., p. 122. Emend.

*Apobembex* Pate, 1937. Amer. Ent. Soc., Mem. 9: 9.

Type-species: *Bembex oculata* of Latreille. Orig. desig.

*Epibembex* Pate, 1937. Amer. Ent. Soc., Mem. 9: 26.

Type-species: *Apis rostrata* Linnaeus. Orig. desig.

This large genus occurs in all major zoogeographic regions and is the only representative of the subfamily in the Old World. These wasps nest in a variety of soils ranging from loose sand subject to blowing to hard-packed soil, and almost all species practice progressive provisioning.



The more primitive species lay the egg on the first prey brought into the cell and the most advanced species place the egg in the empty cell. The nest may have a simple unicellular structure or it may contain up to 5 cells; accessory burrows are made by some of the more advanced species.

**Taxonomy:** Evans and Matthews, 1968. Ent. Soc. Amer., Ann. 61: 1284-1299, 26 figs. (synopsis of N. Amer. spp., keys, characters of species groups).

**Biology:** Evans, 1957. Studies on compar. ethology *Bembix*, 248 pp., 52 figs., 29 tables.

#### SPECIES GROUP BELFRAGEI

These primitive species nest in a variety of soil types, make multicellular nests, and place the egg on the first fly brought into the cell.

**belfragei** Cresson. South cent. U. S. Ecology: Nests in large aggregations in coarse to fine sand, makes a 2-celled nest with each cell at the end of a branch off the main burrow, each with an accessory branch, provides 20-28 prey per cell. Parasite: *Senotainia* sp. in *trilineata* (Wulp) complex; *Dasyneutilla pyrrhus* (Fox)? Prey: Tabanidae spp.; *Systoechus vulgaris* Lw.; *Eristalis agrorum* F., *E. latifrons* Lw., *E. tenax* L., *Volucella fasciata* Macq.; *Orthellia caesarion* Meig., *Stomoxys calcitrans* L.; *Cochliomyia macellaria* (F.), *Phaenicia caeruleiviridis* Macq., *Phormia regina* Meig.; *Sarcophaga bullata* Prkr., *S. cimbicis* Tns., *S. lherminieri* R.-Desv., *S. prohibita* Ald., *S. querula* Wlkr., *S. uncata* Wulp, *S. ventricosa* Wulp, *S. spp.*; *Acroglossa hesperidarum* Will., *Archytas apicifera* Wlkr., *A. aterrima* R.-Desv., *Belvosia semiflava* Ald., *Biomya neomexicana* Tns.?, *Bonnetia comta* Fall., *Ceracia dentata* Coq., *Copecrypta nitens* Wied., *Euphorocera floridensis* Tns., *Gonia sequax* Will., *Microphthalma disjuncta* Wied., *Peleteria* sp., *Phorocera claripennis* Macq., *Prosenoides* sp., *Sturmia* sp., *Winthemia quadripustulata* F., Tachinidae sp.

*Bembex*(!) *belfragei* Cresson, 1873. Amer. Ent. Soc., Trans. 4: 220. ♂.

*Bembex*(!) *cressonii* Handlirsch, 1893. Akad. Wiss. Wien, Math.-Nat. Kl., Sitzber. 102: 792. ♂, ♀.

*Bembex*(!) *insignis* Handlirsch, 1893. Akad. Wiss. Wien, Math.-Nat. Kl., Sitzber. 102: 793. ♂, ♀.

*Bembix cressonii* Dalla Torre, 1897. Cat. Hym., v. 8, p. 503. Lapsus.

**Taxonomy:** Evans and Lin, 1956. Amer. Ent. Soc., Trans. 82: 61, figs. 98-101 (larva).

**Biology:** Evans, 1957. Studies on compar. ethology *Bembix*, pp. 59-78, figs. 13-18 (mating, nest, prey, egg, life cycle). — Evans, 1966. Compar. ethology and evolution of sand wasps, pp. 315-317, fig. 161 (nest, prey, parasite).

**frommeri** Bohart. Calif. (Inyo Co.).

*Bembix frommeri* Bohart, 1970. Pan-Pacific Ent. 46: 201. ♂.

**gillaspys** Evans and Matthews. South. Calif. deserts.

*Bembix gillaspys* Evans and Matthews, 1968. Ent. Soc. Amer., Ann. 61: 1290, figs. 8-9. ♂, ♀.

**rugosa** Parker. Ariz.

*Bembix rugosa* Parker, 1917. U. S. Natl. Mus., Proc. 52: 95. ♀.

**stenobdoma** Parker. West. Tex. to south. Calif.

*Bembix stenobdoma*(!) Parker, 1917. U. S. Natl. Mus., Proc. 52: 79. In key.

*Bembix stenobdoma* Parker, 1917. U. S. Natl. Mus., Proc. 52: 94. ♂.

**U-scripta** Fox. Tex. to south. Calif.; Mexico, Guerrero and Morelos to Baja California. Ecology:

Nests occasionally in large aggregations in soil varying from loose sand to coarse, compact sandy gravel, makes 2-5 cells per nest, places egg on first prey brought into nest, hunts prey and stores nest only at dusk, provides up to 40 prey per cell. Prey: *Hermetia aurata* Bell; *Tabanus texanus* Hine; *Chromolepida pruinosa* (Coq.); *Apiocera harspezi* O. S.; *Efferia* sp., *Erax cressoni* Hine, *E. tuberculatus* Coq., *Psilocurus nudisculus* Lw., *P. modestus* Will., *P. puellus* Brom., *Saropogon* sp., *Stenopogon ebyi* Brom., Asilidae spp.; *Aphobantus* sp. near *hirsutus* Coq., *A. spp.*, *Desmatoneura argentifrons* Will., *Lordotus g. gibbus* Lw., *L. g. striatus* Paint., *Phthiria sulphurea* Lw., *P. sp.*, *Poecilanthrax lucifera* F., *Villa flavipilosa* Cole, *V. parvicornis* Lw., *V.*

*salebrosus* Paint., *V. sp.*; *Volucella fraudulenta* Will., *V. mexicana* Macq., *V. unipuncta* Curr., *V. spp.*, *Syrphidae* spp.; *Acrosticta mexicana* Cole, A. sp.; *Limnophora* sp., *Mydaea* sp., *Phyllogaster cordyluroides* Stein; *Sarcophaga johnsoni* Ald., *S. spp.*, *Senotainia kansensis* Tns.; *Archytas marmoratus* Tns., *Chaetogaedia* sp. near *analis* Wulp., *Goniochaeta plagiosa* Tns., *Olenochaeta kansensis* Tns., *Phorocera tachinomoides* Tns., *P. sp.*, *Promasiphya confusa* Ald., *Ptilodexia* sp., *Tachinophyto* sp. near *vanderwulpi* Tns., *Xenopopia monela* Reinh.

*Bembix dentilabris* Handlirsch, 1893. Akad. Wiss. Wien, Math.-Nat. Kl., Sitzber. 102: 794. ♀. A nomen oblitum.

*Bembex*(!) *U-scripta* Fox, 1895. Acad. Nat. Sci. Phila., Proc., p. 362. ♂, ♀. The valid name for this taxon chosen by the first revisers.

*Bembix arcuata* Parker, 1917. U. S. Natl. Mus., Proc. 52: 81. ♂, ♀.

Taxonomy: Evans, 1959. Amer. Ent. Soc., Trans. 85: 155, figs. 41, 63 (larva). — Evans, 1961 (1960). Psyche 67: 45-61 (possible syn. of *arcuata*).

Biology: Evans, 1957. Studies on compar. ethology *Bembix*, pp. 104-108, figs. 27-28 (nest, prey). — Evans, 1961 (1960). Psyche 67: 45-61, 2 figs. (male sun dance, mating, nest, prey, egg, life cycle). — Evans, 1966. Compar. ethology and evolution of sand wasps, pp. 317-321, figs. 162-164 (nest, prey).

#### SPECIES GROUP AMOENA

Members of this group make simple nests with one or more accessory (false) burrows, place the egg on the first prey brought into the cell, and do not level the mound of excavated earth at the nest entrance.

*amoena* Handlirsch. West. Canada and U. S. Ecology: Nests in colonies in soil varying from sandy loam to coarse sandy gravel, makes 1- or 2-celled nest provided with 1-2 accessory burrows, probably stores more than 30 large prey per cell. Parasite: *Dasymutilla creusa* var. *bellona* (Cr.); *Parnopes edwardsii* Cr. ?; *Physocephala texana* Will. ?; *Miltogrammini* sp.; *Exoprosopa doreadion* O. S., *Villa melasoma* (Wulp). Prey: *Anoplodonta nigrirostris* Lw., *Hedriodiscus varipes* Lw.; *Hybomitra captonis* Mart., *H. fulvilateralis* Macq., *H. liorhina* Phil., *H. opaca* Coq., *H. osburni* Hine, *H. phaenops* O. S.; *Poecilanthrax sackeni* Coq., *Systoechus fumipennis* Paint., *Villa alternata* Say, *V. eumenes* (O. S.), *V. fulviana nigricauda* Lw., *V. harveyi* Hine, *V. lateralis* Say, *V. sinuosa jaenickeana* O. S.; *Thereva* sp.; *Asilus* sp., *Cyrtopogon glarealis* Mel., *Promachus* sp.; *Chrysotoxum ypsilon* Will., *Eristalis anthophorinus* Fall., *E. barda* Say, *E. latifrons* Lw., *Eupeodes volucris* O. S., *Helophilus hybridus* Wlkr., *Metasyrphus lapponicus* Zett., *M. meadii* Jones, *Scaeva pyrastris* L., *Stenosyrphus pullulus* Snow, *Syrphus jonesi* Fluke, *S. opinator* O. S., *S. ribesii* L., *S. vitripennis* Meig., *Volucella esuriens* (F.); *Tetanocera vicina* Meig.; *Helina punctata* R.-Desv., *Limnophora magnipunctata* Mall., *Lispe brevipes* Ald., *Mydaea persimilis* Mall., *Phaonia monticola* Mall., *Pyrellia cyanicolor* Zett.; *Calliphora vicina* R.-Desv., *C. vomitoria* L., *Cynomyopsis cadaverina* R.-Desv., *Eucalliphora lilaea* Wlkr., *Lucilia illustris* Meig., *Melanodexiopsis* sp., *Phormia regina* Meig., *Protophormia terraenovae* R.-Desv.; *Sarcophagta montanensis* Prkr., *Sarcophaga* spp., *Macronychia* sp.; *Acroglossa hesperidarum* Will., *Arctophyto* sp., *Argenteopalpus signiferus* Wlkr., *Bonellimyia subpolita* Brks., *Eumegaparia flaveola* Coq., *Fabriciella brevirostris* Tot., *F. rostrata* Tot., *Gonia porca* Will., *G. spp.*, *Melanodexia* sp., *Melinocera flavicornis* Br., *Mericia albata* Curr., *M. ampela* Wlkr., *M. arcuata* Tot., *M. bicarina* Tot., *Microphthalma disjuncta* Wied., *Paramuscopteryx* sp., *Peleteria iterans* Wlkr., *P. neotexensis* Brks., *Ptilodexia* sp., *Rhachogaster algens* Wied., *Siphosturmiopsis* sp., *Spallanzania* sp., *Trochilodes skinneri* Coq.

*Bembex*(!) *amoena* Handlirsch, 1893. Akad. Wiss. Wien, Math.-Nat. Kl., Sitzber. 102: 769. ♂, ♀.

Taxonomy: Evans, 1964. Amer. Ent. Soc., Trans. 90: 270-271, fig. 53 (larva).

Biology: Evans, 1957. Studies on compar. ethology *Bembix*, p. 59 (nesting site, prey).

— Evans, 1966. Compar. ethology and evolution of sand wasps, pp. 269-288, figs. 149-154 (mating, nest, prey, egg, life cycle, parasite).

*sayi* Cresson. Gulf Coast, Miss. Valley, and Great Plains States west to Colo. and N. Mex.; north. Mexico. Ecology: Nests in small numbers (3-10) in loose to compacted sand, makes a 1-3 celled nest with an accessory burrow, stores 14 or more flies per cell. Parasite: *Amobiopsis confundens* Tns., *Senotainia rubriventris* Macq., *S. opiparis* Reinh., *S. sp. in trilineata* (Wulp) complex. Prey: Stratiomyidae sp.; *Chlorotabanus crepuscularis* Beq., *Chrysops flvida* Wied., *C. spp.*, *Hybomitra hinei wrighti* Whit., *Silvius quadrivittatus* Say, *Tabanus cheliopterus fronto* O. S., *T. fratellus* Will., *T. lineola* F., *T. melanocerus lacustris* Stone, *T. nigripes* Wied., *T. quinquevittatus* Wied.; *Etoprosopa fasciata* Macq., *E. fascipennis noctula* Wied., *Geron* sp., *Phthiria* sp., *Poecilanthrax lucifer* F., *Systoechus solitus* Wlkr., *S. vulgaris* Lw., *Villa cypris* Meig., *V. flavicostalis* Paint., *V. lateralis* Say, *V. molitor* Lw.; *Furcifer punctipennis* Wied.; *Ablautus nigronotum* Wilcox, *Erax tabascens* Bks., *E. sp.*, *Mallophorina laphroides* Wied., Asilidae sp.; *Allograpta obliqua* Say, *Eristalis agrorum* F., *E. albifrons* Wied., *E. tenax* L., *Microdon rufipes* Macq., *Syrphus* sp., *Volucella pusilla* Macq., *V. sp.*; *Musca domestica* L., *Orthellia caesarion* Meig.; *Phaenicia caeruleiviridis* Macq.; *Sarcophaga ventricosa* Wulp; *Archytas analis* F., *Belvosia slossonae* Coq., *Fabriciella actinosa* Reinh., *F. egula* Reinh., *F. latigena* Tot., *Gonia sequax* Will., *Juriniopsis* sp., *Paradidyma singularis* Tns., *Phorocera claripennis* Macq., *Prosenoides flavipes* Coq., Tachinidae sp.

*Bembex*(!) *sayi* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 467. ♀.

*Bembix latifrons* Parker, 1917. U. S. Natl. Mus., Proc. 52: 116. ♀.

Taxonomy: Evans and Lin, 1956. Amer. Ent. Soc., Trans. 82: 60, figs. 94-97 (larva).

Biology: Rohwer, 1909. Univ. Colo. Studies 6: 245 (nest, prey). —Hungerford and Williams, 1912. Ent. News 23: 247 (nest, prey). —Evans, 1957. Studies on compar. ethology *Bembix*, pp. 48-59, figs. 11-12 (mating, nest, prey, egg, life cycle, parasite). —Evans, 1966. Compar. ethology and evolution of sand wasps, pp. 288-298, figs. 155-158 (nest, prey, parasites). —Aleoek and Gamboa, 1975. Ariz. Acad. Sci., Jour. 10: 154, fig. 1 (nest).

#### SPECIES GROUP CINEREA

These species nest in soil with a high saline content, make simple multicellular nests, and place the egg on the first fly brought into the cell.

**cinerea** Handlirsch. N. J. to Fla. west to Tex. Ecology: Nests in very large aggregations on salt flats in heavy black soil with high salt content, makes 1-2 cells per nest, stores 11-17 medium sized prey per cell. Parasite: *Dasymutilla cypris* (Bl.), *D. vesta sappho* (Fox). Prey: *Eulalia evansi* James, *Hedriodiscus dorsalis* F.; *Tabanus lineola* F., *T. nigrovittatus* Macq., *T. vittiger bellardii* Szil., *T. spp.*; *Anthrax anale* Say; *Eristalis albifrons* Wied.; *Dimocoenia austrina* Coq.; *Lispe* sp. near *sordida* Ald., *Phyllogaster* sp.; *Phaenicia cluvia* Wlkr.; *Gymnopsa texana* Tns.; *Cistogaster* sp.

*Bembex*(!) *cinerea* Handlirsch, 1893. Akad. Wiss. Wien, Math.-Nat. Kl., Sitzber. 102: 837. ♂, ♀.

Taxonomy: Evans and Lin, 1956. Amer. Ent. Soc., Trans. 82: 59, fig. 109 (larva).

Biology: Krombein and Evans, 1954. Ent. Soc. Wash., Proc. 56: 235 (nest). —Krombein and Evans, 1955. Ent. Soc. Wash., Proc. 57: 233-234 (nest, prey, parasite). —Evans, 1957. Studies on compar. ethology *Bembix*, pp. 78-94, figs. 19-23 (male sun dance, mating, nest, prey, egg, life cycle, parasite).

**hinei** Parker. La., Tex., coastal only. Ecology: Nests in hard packed sand beach above high-tide mark, occasionally in large aggregations, makes at least 5 cells per nest, stores 7-13 prey per cell. Prey: *Eulalia cincta* Latr.; *Tabanus lineola* F., *T. nigrovittatus* Macq.; *Eristalis albifrons* Wied.

*Bembix hinei* Parker, 1917. U. S. Natl. Mus., Proc. 52: 86. ♂, ♀.

Taxonomy: Evans, 1959. Amer. Ent. Soc., Trans. 85: 156 (larva).

Biology: Hine, 1906. La. State Crop Pest Comn., Cir. 6: 27 (nesting site, prey; misd. as *belfragei* Cr.). —Strandtmann, 1953. Kans. Ent. Soc., Jour. 26: 48-49 (nest, prey). —Evans, 1957. Studies on compar. ethology *Bembix*, pp. 94-104, figs. 24-26 (nest, prey transport, egg, life cycle).

## SPECIES GROUP AMERICANA

These species make simple multicellular nests, place the egg on the first prey brought into the nest, and, so far as known, level the mound of excavated earth at the nest entrance.

**americana comata** Parker. Pacific Coast of N. Amer. to Mexico. Ecology: Nests in sand or powdery soil, makes 1-3 cells per nest, provides 16-44 prey per cell. Parasite: *Parnopes edwardsii* (Cr.); *Physocephala affinis* Will. Prey: *Apatolestes hera* O. S.; *Thereva niveipennis* Kroeb.; *Hydrophorus gratus* Ald., *H. sp.*; *Eristalis arbustorum* L., *E. latifrons* Lw., *E. tenax* L., *Heliophilus* sp., *Melanostoma* sp., *Mesograpta geminata* Say, *M. marginata* Say, *Metasyrphus subsimilis* Fluke, *Sphaerophoria cylindrica* Say, *S. sulphuripes* (Thom.), *Syrphus* sp., *Toxomerus* sp.; *Ceroxys latiuscula* Lw.; *Coenosia tigrina* F., *Helina bispinosa* Mall., *H. procedens* Wlkr., *Hylemya cilicrura* Rond., *Lispa tentaculata* DeG., *Muscina assimilis* Fall., *Musca domestica* L., *Ophyra leucostoma* Weid., *Pegomyia duplicata* Mall.; *Spaziphora cincta* (Lw.); *Calliphora terraenovae* Macq., *Phaenicia sericata* Meig., *Phormia regina* Meig., *Pollenia rudis* F.; *Sarcophaga rapar* Wlkr., *S. spp.*, *Senotainia trilineata* (Wulp); *Bonnetia comata* (Fall.), *Derodes cinerea* Tns., *Tachinomyia similis* Will. Typical *americana* F. occurs in the West Indies. *Bembix comata* Parker, 1917. U. S. Natl. Mus., Proc. 52: 100. ♂, ♀. *Bembix comata* var. *nevadensis* Rodeck, 1934. Amer. Mus. Novitates 692: 1. ♂.

Taxonomy: Evans and Lin, 1956. Amer. Ent. Soc., Trans. 82: 59 (larva).

Biology: Parker, 1925. Ent. Soc. Wash., Proc. 27: 189-195 (nest, prey capture and transport, cocoon). —Bohart and MacSwain, 1940. Pan-Pacific Ent. 16: 16 (parasite). —Evans, 1957. Studies on compar. ethology *Bembix*, pp. 36-48, figs. 8-10 (mating, nest, prey transport, egg, parasite). —Alcock, 1973 (1972). Psyche 79: 158-164 (nest construction). —Alcock, 1973. Wasmann Jour. Biol. 31: 331-332 (prey).

**americana hamata** Fox. Calif., Santa Cruz to San Miguel Islands only.

*Bembix hamata* Fox, 1923. Psyche 30: 6. ♂.

*Bembix hamata lucida* Fox, 1923. Psyche 30: 7. ♂.

*Bembix sanctae-rosae* Cockerell, 1940. South. Calif. Acad. Sci., Bul. 38: 135.

**americana nicolai** Cockerell. Calif., San Nicolas Island only.

*Bembex(?) nicolai* Cockerell, 1938. Pan-Pacific Ent. 14: 150. ♂, ♀.

**americana spinolae** Lepeletier. N. Amer. except Pacific Coast States. Ecology: Nests in soil varying from open sand to coarse soil, makes a unicellular nest, stores 16-24 prey per cell. Parasite: *Physocephala texana* Will.; *Phrosinella fulvicornis* (Coq.)?, *Opsidia gonioides* Coq., *Senotainia vigilans* Allen, *S. trilineata* (Wulp), *Miltogrammini* spp.; *Exoprosopa fascipennis* (Say); *Parnopes chrysoprasinus* Sm.?; *P. edwardsii* (Cr.)?; *Dasyntulla bioculata* (Cr.)?; *Macrosiagon flavipenne* LeC. Prey: *Eulalia cincta* Oliv., *Odontomyia hoodiana* Big., *O. virgo* Wied.; *Chrysops aestuans abaestuans* Phil., *C. flavida* Wied., *C. furcatus* Wlkr., *C. lugens* Wied., *C. mitis* O. S., *C. niger* Macq., *C. noctifer pertinax* Will., *C. pudicus* O. S., *Hybomitra osburni* Hine, *H. phaenops* O. S., *Silvius quadrivittatus* Say, *Tabanus atratus* L., *T. coffeatus* Macq., *T. daeckei* Hine, *T. insuetus* O. S., *T. lasiophthalmus* Macq., *T. phaenops* O. S., *T. pumilus* Macq., *T. quinquevittatus* Wied., *T. vittiger schwardti* Phil.; *Conophorus painteri* Prid., *Exoprosopa pueblensis* Jaen., *Phthiria sulfurea* Lw., *Sparnopolius brevirostris* Macq., *S. fuleus* Wied., *Systoechus fumipennis* Paint., *S. vulgaris* Lw., *Villa agrippina* O. S., *V. alternata* Say, *V. fulviana* Say, *V. lateralis* Say, *V. sinuosa jaenickiana* O. S.; *Furcifer rufiventris* Lw., *Psilocephala haemorrhoidalis* Macq., *Thereva cingulata* Kroeb.; *Asilus* sp., *Atomosia melanopogon* Herm., *Lasiopogon cinereus* Cole, *Tolmerus callidus* Will.; *Chrysotoxum ventricosum* Lw., *Dasysyrphus analopsis* O. S., *Eristalis arbustorum* L., *E. sp.*, *Eupeodes volucris* O. S., *Helophilus latifrons* Lw., *H. obscurus* Lw., *Melanostoma* sp., *Metasyrphus astutus* Fluke, *M. palliventris* Curr., *Microdon lanceolatus* Adams, *Paragus bicolor* F., *Scaeva pyrastris* L., *Sphaerophoria* sp., *Syrphus opinator* O. S., *S. ribesii* L., *Xylota bigelowi* Curr.; *Rivellia* sp., *Penocera quadrilineata* Mel., *Sepedon fuscipennis* Lw., *Tetanocera plumosa* Lw.; *Cordilura latifrons* Lw., *Hydrophoria divisa* Meig., *Hylemya* sp.; *Calythea separata* Mall., *Helina cinerella* Wulp, *H. latifrons* Zett., *H. troene* Wlkr., *Musca domestica* L., *Phaonia deleta* Stein,

*Pyrellia serena* Meig., *Quadrularia annosa* Zett., *Siphona irritans* L., *Spilogona* sp., *Stomoxys calcitrans* L.; *Eucalliphora lilaea* Wlkr., *Lucilia illustris* Meig., *L.* sp., *Phaenicia sericata* Meig., *Phormia regina* Meig., *Pollenia rudis* F.; *Eumacronychia* sp., *Sarcophaga derelicta* Wlkr., *S. importuna* Wlkr., *S. planifrons* Ald., *S. querula* Wlkr., *Senotainia flavicornis* Tns., *S. trilineata* (Wulp); *Bonellimyia glauca* Brooks, *Cuphocera stricklandi* Curr., *Dinera* sp., *Microphthalma disjuncta* Wied., *Nearchus duplaris* Reinh., *Paradidyma singularis* Tns., *Peleteria confusa* Curr., *Philexera* sp., *Siphoplagia spinulosa* Big., *Trochilodes skinneri* Coq., *Winthemia quadripustulata* F. *Bembex*(?) *spinolae* Lepeletier, 1845. Hist. Nat. Ins. Hym., v. 3, p. 227. ♂. *Bembex*(?) *similans* Fox, 1895. Acad. Nat. Sci. Phila., Proc. 47: 358. ♂, ♀. *Bembex*(?) *connexus* Fox, 1895. Acad. Nat. Sci. Phila., Proc. 47: 360. ♂, ♀. *Bembex*(?) *primaestate* Johnson and Rohwer, 1908. Ent. News 19: 378. ♀.

Taxonomy: Evans and Lin, 1956. Amer. Ent. Soc., Trans. 82: 58, fig. 108 (larva).

Biology: Walsh and Riley, 1869. Amer. Ent. 1: 126 (nest, prey). — Peckham and Peckham, 1898. Wis. Geol. Nat. Hist. Survey, Bul. 2: 58-76 (nest, prey, parasite, life cycle). — Barber, 1915. Ent. Soc. Wash., Proc. 17: 187-188 (parasite). — Parker, 1917. U. S. Natl. Mus., Proc. 52: 127-131 (mating, nest, prey transport, life cycle, cocoon). — Rau and Rau, 1918. Wasp studies affield, pp. 37-38 (nest, prey, parasite ?). — Rau, 1922. Acad. Sci. St. Louis, Trans. 24 (7): 29, fig. 8 (nest). — Krombein, 1936. Ent. News 47: 95 (prey, parasite). — Evans, 1957. Studies on compar. ethology *Bembix*, pp. 17-36, figs. 6-7 (mating, nest, prey capture and transport, egg, life cycle, parasites). — Evans, 1966. Compar. ethology and evolution of sand wasps, pp. 311-315, fig. 160 (nest, prey, parasites).

Morphology: Snodgrass, 1941. Smithsn. Inst., Misc. Collect. 99 (14): pl. 21, figs. M-P (male genitalia).

**cameroni** Rohwer. Southwest. U. S.; centr. Mexico. Ecology: Nests in alluvial soil with sand on surface and frequently silt or loam beneath surface. Prey: *Esenbeckia delta* Hine; *Geron* sp., *Phthiria sulphurea* Lw.; *Eristalis latifrons* Lw.; *Musca domestica* L., *Orthellia caesarion* Meig.; *Peleteria* sp., *Plagioprospherysa parvipalpis* Wulp.

*Bembix*(?) *cameroni* Rohwer, 1912. U. S. Natl. Mus., Proc. 41: 467. ♂.

*Bembix festiva* Parker, 1929. U. S. Natl. Mus., Proc. 75 (5): 118. ♂.

*Bembix rohweri* Maidl and Klima, 1948 (1944). In Lohrmann, Muenchen. Ent. Gesell., Mitt. 34: 424. N. name for *cameroni* Roh. which is not preocc.

Biology: Evans, 1966. Compar. ethology and evolution of sand wasps, pp. 310-311 (nest, prey).

**nubilipennis** Cresson. Miss. Valley, Great Plains and southwest. States; Mexico (San Luis Potosi). Ecology: Nests in large aggregations in hard-packed soil, makes 1-5 cells per nest, stores up to 48 prey per cell. Parasite: *Parnopes chrysoprasinus* Sm.; Miltogrammini spp. Prey: *Hedriodiscus truquii* (Bell.), *Nemotelus trinotatus* Mel., *Stratiomys jamesi* Steysk., *S. meigenii* Wied., *S. nigriventris* Lw.; *Tabanus sulcifrons* Macq., *T. trimaculatus* Beauv.; *Anthrax anale* Say, *A. irrorata* Say, *Bombylius io* Will., *Ezoprosopa emarginata* Macq., *E. fasciata* Macq., *Poecilanthrax lucifera* (F.), *Sparnopolius brevirostris* Macq., *Villa* spp.; *Neorhynchocephalus sackenii* (Will.); *Atomosia puella* (Wied.), *Diogmites misellus* Lw., *D. umbrinus* Lw., *Erax* sp. near *tuberculatus* Coq., *Proctacanthella cacopiloga* (Hine); *Eristalis arbustorum* (L.), *E. tenax* (L.); *Chrysomya demandata* (F.), *Tetanops luridipennis* Lw.; *Paracantha culta* (Wied.); *Musca domestica* L., *Orthellia caesarion* (Meig.), *Stomoxys calcitrans* (L.); *Bufolucilia silvarum* (Meig.), *Lucilia illustris* (Meig.), *Phaenicia caeruleiviridis* (Macq.), *P. sericata* (Meig.), *Pollenia rudis* (F.); *Sarcophaga assidua* Wlkr., *S. derelicta* Wlkr., *S. helici* Tns., *S. lherminieri* R.-Desv., *S. rapax* Wlkr., *S. sinuata* Meig., *S. ventricosa* Wulp, S. sp.; *Aplomyia theclarum* (Scud.), *Archytas apiciferus* Wlkr., *A. metallicus* (R.-Desv.), *Gymnoclytia occidua* (Wlkr.), *Hyalomyodes triangulifera* (Lw.), *Phorocera claripennis* Macq., *P. tachinomoides* Tns., *Trichopoda pennipes* (F.).

*Bembex*(?) *nubilipennis* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 218. ♂, ♀.

*Bembix nubilosa* Parker, 1929. U. S. Natl. Mus., Proc. 75 (5): 140. ♀.

Taxonomy: Evans, 1959. Amer. Ent. Soc., Trans. 85: 42 (larva).

Biology: Parker, 1910. Ohio Nat. 10: 163-165 (nest, prey, parasite ?). — Rau and Rau, 1918. Wasp studies afield, pp. 9-37, figs. 2-6 (sun dance, nest, prey, life cycle, cocoon). — Rau, 1922. St. Louis Acad. Sci., Trans. 24 (7): 29-30 (sun dance, nest). — Rau, 1935. Psyche 41: 243-244 (nesting site). — Evans, 1966. Compar. ethology and evolution of sand wasps, pp. 298-308, fig. 159 (sun dance, mating, nest, prey, egg, life cycle, parasites).

## SPECIES GROUP TEXANA

These species make unicellular nests and place the egg in an erect position in the empty cell. False burrows are frequently constructed, and one species removes the prey remains before bringing in fresh prey.

**melanaspis** Parker. Southwest. U. S.; Mexico (Baja California). Ecology: Makes unicellular nest in sand; lays egg in empty cell. Prey: Tabanidae, Therevidae, Syrphidae, Conopidae, Calliphoridae; Coenagrionidae.

*Bembix melanaspis* Parker, 1917. U. S. Natl. Mus., Proc. 52: 109. ♂, ♀.

Biology: Alcock and Gamboa, 1975. Ariz. Acad. Sci., Jour. 10: 160-161, fig. 2 (nest, prey).

**texana** Cresson. Southeast. and south. States. Ecology: Nests in loose to hard-packed sand, sometimes in large aggregations, makes a unicellular nest sometimes with one or two accessory burrows, places egg in empty cell, usually removes old prey remains from cell before bringing in fresh prey. Parasite: *Dasymutilla pyrrhus* (Fox)? Prey: *Hedriodiscus trivittatus* Say, *Odontomyia* sp., *Stratiomyidae* sp.; *Chlorotabanus crepuscularis* Beq., *Chrysops dimmocki* Hine, *C. pudica* O. S., *Hybomitra hinei wrighti* Whit., *Tabanus abdominalis* F., *T. bishoppi* Stone, *T. coarctatus* Stone, *T. endymion* O. S., *T. fuscicostatus* Hine, *T. gracilis* Wied., *T. lineola* F., *T. melanocerus lacustris* Stone, *T. mularis* Stone, *T. nigripes* Wied., *T. quinquevittatus* Hine, *T. sparus milleri* Whit., *T. trijunctus* Wlkr.; *Villa* sp.; *Meromacrus acutus* F., *Microdon fulgens* Wied., *Tubifera* sp.; *Micropezidae* sp.; *Cochliomyia macellaria* F., *Phaenicia caeruleiviridis* Macq.; *Exorista larvarum* L., *Tachinidae* spp.

*Bembix fasciata* Fabricius, 1804. Systema Piezatorum, p. 224. Preocc. This is a questionable synonym.

*Bembex*(!) *texana* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 219. ♀.

Taxonomy: Evans and Lin, 1956. Amer. Ent. Soc., Trans. 82: 62, figs. 105-107 (larva).

Biology: Evans, 1957. Studies on compar. ethology *Bembix*, pp. 135-141, fig. 37 (nest, egg, prey, life cycle). — Krombein, 1958. Ent. Soc. Wash., Proc. 60: 107-110 (nest, prey).

— Evans, 1966. Compar. ethology and evolution of sand wasps, pp. 323-335, figs. 165-170 (male sun dance, nest, prey, parasite ?).

**troglodytes** Handlirsch. Southwest. States north to Kans.; north. Mexico. Ecology: Nests in fine-grained damp sand along watercourse, not markedly gregarious, makes unicellular nest frequently with an accessory burrow, places egg in empty cell, stores 21-26 prey per cell. Parasite: *Timulla leona* (Bl.)?; *Exoprosopa fascipennis* (Say)? Prey: *Eulalia communis* James, *Hedriodiscus truquii* (Bell.), *Hoplitomyia constans* Lw., *Stratiomys meigenii* Wied.; *Chrysops sequax* Will., *C. wiedemanni* Kroeb., *Tabanus* sp.; *Exoprosopa fascipennis* (Say), *E. iota* (O. S.), *Sparnopolius* sp., *Systoechus vulgaris* Lw., *Villa chimaera* (O. S.), *V. salebrosa* Paint.; *Chrysogaster nitida* Wied., *Eristalis tenax* L.; *Musca domestica* L.; *Orthellia caesarion* Meig., *Stomoxys calcitrans* L.; *Callitroga macellaria* F., *Phormia regina* Meig.; *Amobia* sp., *Amobiopsis aurata* Coq., *Sarcophaga derelecta* Wlkr., *S. lherminieri* R.-Desv., *S. opifera* Coq., *S. rapax* Wlkr., *S. ventricosa* Wulp., *Senotainia flavicornis* Tns., *S. litoralis* Allen, *S. trilineata* (Wulp.), *S. sp.*; *Achaetoneura* sp., *Copecrypta nitens* Wied., *Gymnoclytia occidua* Wlkr., *Phorocera claripennis* Macq.

*Bembex*(!) *troglodytes* Handlirsch, 1893. Akad. Wiss. Wien, Math.-Nat. Kl., Sitzber. 102: 829. ♂, ♀.

*Bembix helianthopolis* Parker, 1917. U. S. Natl. Mus., Proc. 52: 113. ♂, ♀.

Taxonomy: Evans and Lin, 1956. Amer. Ent. Soc., Trans. 82: 61, figs. 102-104 (larva).

Biology: Evans, 1957. Studies on compar. ethology *Bembix*, pp. 116-135, figs. 29-36 (male sun dance, mating, nest, egg, prey, life cycle, parasites?). — Evans, 1966. Compar. ethology and evolution of sand wasps, pp. 335-337 (nest, prey).

## SPECIES GROUP PRUINOSA

The two species of this group make deep, complex unicellular nests, place the egg flat in the empty cell, and remove prey remains from the cell.

**occidentalis** Fox. West. and southwest. U. S.; north. Mexico. Ecology: Makes complex unicellular nest in sand dunes, sometimes in large aggregations, lays egg in empty cell, cleans nest frequently so number of prey provided is unknown. Parasite: *Dasyutilla sackenii* (Cr.); *Villa atrata* (Coq.), *V. melasoma* Wulp, *Exoprosopa eremita* O. S.; *Physocephala affinis* Will. Prey: *Stratiomys laticeps* Lw.; *Apatolestes villosulus* Big., *Chrysops* sp., *Tabanus punctifer* O. S.; *Aphoebantus tardus* Coq., A. sp., *Villa sinuosa* Wied., V. sp. near *agrippina* O. S.; *Psilocephala costalis* Lw.; *Apiocera haruspex* O. S., A. sp.; *Eristalis latifrons* Lw., *Helophilus latifrons* Lw., *Lejops lululatus* Meig., *Melanostoma rostratum* Big., *Metasyrphus meadii* Jones; *Anacamptis latiuscula* Lw.; *Musca domestica* L., *Paregle cinerella* Fall.; *Calliphora erythrocephala* Meig., *Lucilia illustris* Meig., *Phaenicia sericata* Meig., *Phormia regina* Meig.; *Sarcophaga bullata* Prkr., S. sp.; *Aphria ocypterata* Tns. Predator: *Proctacanthus occidentalis* Hine.

*Bembex*(!) *occidentalis* Fox, 1893. Calif. Acad. Sci., Proc. (2) 4: 10. ♂, ♀.

*Bembex*(!) *beutenmuelleri* Fox, 1901. N. Y. Ent. Soc., Jour. 9: 83. ♂.

*Bembex*(!) *obsoleta* Howard, 1901. Insect Book, pl. 4, fig. 36.

Taxonomy: Evans and Lin, 1956. Amer. Ent. Soc., Trans. 82: 58, figs. 85-87 (larva).

Biology: Coquillett, 1895. Ent. Soc. Wash., Proc. 3: 236-237 (nest, prey; misdet. as *cinerea* Handl.). — Bohart and MacSwain, 1939. South. Calif. Acad. Sci., Bul. 38: 84-98 (mating, nest, prey, parasites). — Ross, 1953. Insects close up, pp. 42-43, 5 figs. (nest, prey, cocoon, parasites). — Evans, 1957. Studies on compar. ethology *Bembix*, pp. 167-181, figs. 47-49 (mating, nest, prey).

**pruinosa** Fox. U. S.; Mexico. Ecology: Nests in large aggregations in loose sand, frequently in dunes, makes a long unicellular nest sometimes with an accessory burrow, places egg in empty cell, provides 20-30 prey per cell, placing later flies in a long single file. Parasite: *Dasyutilla bioculata* (Cr.); *Parnopes edwardsii* (Cr.)?; *Physocephala texana* Will.; *Exoprosopa fascipennis* (Say), *E. arenicola* Johns. and Johns., *Villa atrata* (Coq.); *Senotainia inyoensis* Reinh.? Prey: *Anoplodonta nigrirostris* Lw., *Eudalia cincta* Oliv., *Odontomyia tumida* Bks., *Stratiomys jamesi* Steysk., *S. norma* Wied.; *Chrysops flavida* Wied., *Tabanus equalis* Hine, *T. fulvulus* Wied., *T. lineola* F., *T. productus* Hine, *T. quinquevittatus* Wied., *T. sulcifrons* Macq., *T. trispilus* Wied., *T. vittiger* schwardti Phil.; *Anastoechus barbatus* O. S., *Aphoebantus* sp., *Bombylius medorae* Paint., *Exoprosopa fascipennis* (Say), *E. divisa* Coq., *Heterostylum robustum* O. S., *Lepidanthrax proboscidea* Lw., *Poecilanthrax lucifera* F., *P. sackenii* Coq., *P. willistoni* Coq., *Villa alternata* Say, *V. cypris* Meig., *V. faustina* O. S., *V. fulviana nigricauda* Lw., *V. lateralis* Say, *V. molitor* Lw.; *Psilocephala aldrichii* Coq., *P. haemorrhoidalis* Macq.; *Plagioneurus univittatus* Lw.; *Asemosyrphus polygrammus* Lw., *Eristalis albifrons* Wied., *E. arbustorum* L., *E. brousi* Will., *E. latifrons* Lw., *E. tenax* L., *E. vinetorum* F., *Eupeodes volucris* O. S., *Helophilus latifrons* Lw., *Platycheirus erraticus* Curr., *Rhingia nasica* Say, *Sericomyia chrysotoxoides* Macq., *Sphaerophoria robusta* Curr., *Syrphus rectus* O. S., *S. torvus* O. S., *Xylota metallica* Wied.; *Ceroxys calcitrans* L.; *Hydrophoria divisa* Meig.; *Limnophora narona* Wlkr., *Lispe cotidiana* Snyder, *L. nasoni* Stein, *Musca autumnalis* DeG., *M. domestica* L., *Muscina assimilis* Fall., *M. dorsilinea* Wulp, *Orthellia caesarion* Meig., *Pyrellia cyanicolor* Zett., *Stomoxys calcitrans* L.; *Bufolucilia silvarum* Meig., *Callitroga macellaria* F., *Eucalliphora lilaea* Wlkr., *Lucilia illustris* Meig., *Phaenicia sericata* Meig., *Phormia regina* Meig., *Pollenia rudis* F.; *Amobia floridensis* (Tns.), *Sarathromyia femoralis* Sch., *Sarcophaga derelicta* Wlkr., *S. errabunda* Wulp, *S. lherminieri* R.-Desv., *S. querula* Wlkr.; *Achaetoneura archippivora* Riley, *Admontia* sp., *Archytas apicifera* Wlkr., *Paradidyma affinis* Reinh., *Peleteria eronis* Curr., *Spallanzania* sp., *Sitophaga* sp., *Winthemia rufopicta* Big.

*Bembex*(!) *pruinosa* Fox, 1895. Acad. Nat. Sci. Phila., Proc. 47: 361. ♂, ♀.

Taxonomy: Evans and Lin, 1956. Amer. Ent. Soc., Trans. 82: 57, figs. 88-93 (larva).

Biology: Mickel, 1924. Ent. News 35: 236-242 (parasite). — Evans, 1957. Studies on comparative ethology *Bembix*, pp. 142-167, figs. 38-46 (hopping dance, mating, nest, prey, egg, life cycle, parasites). — Evans, 1966. Comparative ethology and evolution of sand wasps, pp. 345-349 (hopping dance, nest, prey capture, parasites).

### Genus STICTIELLA Parker

*Stictiella* Parker, 1917. U. S. Natl. Mus., Proc. 52: 21.

Type-species: *Monedula formosa* Cresson. Orig. desig.

*Microstictia* Gillaspay, 1963. Ent. News 74: 196.

Type-species: *Monedula femorata* Fox. Orig. desig.

The genus is restricted to the Nearctic Region and all but one species occur in America north of Mexico. The species whose biology is known use adult Lepidoptera as prey and usually practice mass provisioning, although there is one record suggestive of progressive provisioning in *serrata*, a species also known to practice mass provisioning.

Taxonomy: Gillaspay, 1959. Pan-Pacific Ent. 35: 193 (species groups). — Gillaspay, Evans and Lin, 1962. Ent. Soc. Amer., Ann. 55: 559-566, 1 fig. (partition into *Stictiella* and *Xerostictia* on morph. characters).

Biology: Gillaspay, Evans and Lin, 1962. Ent. Soc. Amer., Ann. 55: 559-563, fig. 1 (ethology).

*callista* Parker. Ariz., N. Mex. Ecology: Nests in sand. Prey: *Melipotis indomita* (Wlkr.); *Strymon melinus pudica* Edw.; Hesperidae sp.

*Stictiella callista* Parker, 1917. U. S. Natl. Mus., Proc. 52: 34. ♂, ♀.

Biology: Gillaspay, Evans and Lin, 1962. Ent. Soc. Amer., Ann. 55: 562 (prey). — Alcock and Gamboa, 1975. Ariz. Acad. Sci., Jour. 10: 160 (nest, prey).

*corniculata* Mickel. Wyo. to Calif.

*Stictiella corniculata* Mickel, 1918 (1917). Nebr. Univ. Studies 17: 332. ♂.

Taxonomy: Gillaspay, 1963. Ent. News 74: 251-252.

*divergens* Parker. Kans.

*Stictiella divergens* Parker, 1917. U. S. Natl. Mus., Proc. 52: 55. ♂.

*emarginata* (Cresson). Generally distributed throughout the U. S. and south. Canada. Prey:

*Euxoa quinquelinea incallida* (Sm.).

*Monedula emarginata* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 468. ♂, ♀.

*Monedula mamillata* Handlirsch, 1890. Akad. Wiss. Wien, Math.-Nat. Kl., Sitzber. 99: 146. ♂, ♀.

Biology: Bradley, 1908. Ent. Soc. Amer., Ann. 1: 129 (sleeping aggregation). — Gillaspay, Evans and Lin, 1962. Ent. Soc. Amer., Ann. 55: 562 (prey).

*exigua* (Fox). Mont.

*Monedula exigua* Fox, 1895. Acad. Nat. Sci. Phila., Proc. 47: 370. ♀.

*femorata* (Fox). Fla., Tex.

*Monedula femorata* Fox, 1895. Acad. Nat. Sci. Phila., Proc. 47: 368. ♂.

*formosa* (Cresson). Kans., Okla., Tex. Ecology: Nests in sand, makes 5-17 cells per nest, stores 6-11 butterflies per cell, practices mass provisioning. Parasite: Acarina sp.; Diptera sp.

Prey: *Polites* sp., *Hylephila phyleus* Dru., *Atalopedes campestris* Bois., *Pyrgus*

*communis* Grt., *Thanaos zarucco* Luc.; *Phyciodes phaon* Edw., *Libythea larvata* Streck., L. sp.; *Strymon melinus* Hbn.

*Monedula formosa* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 221. ♂, ♀.

Taxonomy: Evans, 1964. Amer. Ent. Soc., Trans. 90: 260, figs. 37-41 (larva).

Biology: Gillaspay, Evans and Lin, 1962. Ent. Soc. Amer., Ann. 55: 559-561 (nest, prey, parasite).

*minutula* (Handlirsch). Tex.

*Monedula minutula* Handlirsch, 1890. Akad. Wiss. Wien, Math.-Nat. Kl., Sitzber. 99: 148. ♀.

*nubilosa* Gillaspay. Calif. (Los Angeles).

*Stictiella nubilosa* Gillaspay, 1963. Ent. News 74: 252. ♀.



**plana** (Fox). Great Plains States.

*Monedula plana* Fox, 1895. Acad. Nat. Sci. Phila., Proc. 47: 367. ♂.

**pulchella** (Cresson). Colo. to Calif. Ecology: Usually makes unicellular nest in sand but rarely 2 cells, stores as many as 19 moths in a completed cell. Prey: *Leptotes marina* Reak.; *Lorostege similalis* Guen.; *Characoma proteella* Dyar.

*Monedula pulchella* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 471. ♂, ♀.

*Stictiella melanosterna* Parker, 1917. U. S. Natl. Mus., Proc. 52: 30. ♂, ♀.

Taxonomy: Gillaspay, 1963. Ent. News 74: 252 (synonymy). — Evans, 1964. Amer. Ent. Soc., Trans. 90: 260-261, fig. 42 (larva).

Biology: Gillaspay, Evans and Lin, 1962. Ent. Soc. Amer., Ann. 55: 560, 562-563 (nest, prey, sleeping aggregation).

**serrata** (Handlirsch). Fla., Ga., N. C. Ecology: Nests in fine-grained sand, makes unicellular nest, stores 12 to more than 21 moths per cell, practices both mass and progressive provisioning. Parasite: *Senotainia* sp. near *rubriventris* Macq. Prey: *Elasmopalpus lignosellus* (Zell.); *Hellula rogatilis* (Hulst); *Bactra verutana* Zell., *Eucosminae* sp.; *Crambus satrapellus* Zink. *C. quinquareatus* Zell., *C. sp.*, *Argynia argentana* Martyn; *Jocara* sp.

*Monedula serrata* Handlirsch, 1890. Akad. Wiss. Wien, Math.-Nat. Kl., Sitzber. 99: 143. ♂.

Taxonomy: Evans and Lin, 1956. Amer. Ent. Soc., Trans. 82: 51, figs. 59-62 (larva).

Biology: Gillaspay, Evans and Lin, 1962. Ent. Soc. Amer., Ann. 55: 561-562, fig. 1 (nest, prey transport, egg, life cycle). — Krombein, 1964. Amer. Mus. Novitates 2201: 19-20 (nest, prey transport, life cycle, cocoon).

**speciosa** (Cresson). Alta., Ariz., Sask., Colo., N. Mex., Nebr., Kans.

*Monedula speciosa* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 470. ♀.

**spinifera** (Mickel). Alta., Kans., Nebr.

*Stictia spinifera* Mickel, 1916. Amer. Ent. Soc., Trans. 42: 418. ♂.

*Stictiella melampous* Parker, 1917. U. S. Natl. Mus., Proc. 52: 43. ♂.

**tuberculata** (Fox). Idaho, Nev., Wash.

*Monedula tuberculata* Fox, 1895. Acad. Nat. Sci. Phila., Proc. 47: 366. ♂.

### Genus GLENOSTICTIA Gillaspay

*Glenostictia* Gillaspay, 1962. In Gillaspay, Evans and Lin, Ent. Soc. Amer., Ann. 55: 563.

Type-species: *Monedula pulla* Handlirsch. Orig. desig.

This genus occurs only in the Nearctic Region and all species are found in America north of Mexico. So far as known the members of the genus practice progressive provisioning and prey upon adult Hymenoptera, Diptera and Hemiptera.

Biology: Gillaspay, Evans and Lin, 1962. Ent. Soc. Amer., Ann. 55: 563-566 (ethology).

**argentata** (Fox). Calif.; Mexico. Ecology: Nests in sand dune, practices progressive provisioning. Prey: Primarily Bombyliidae.

*Stictiella argentata* Fox, 1923. Calif. Acad. Sci., Proc. (4) 12: 434. ♂, ♀.

Biology: Alcock, 1975. Southwest. Nat. 20: 339 (nest, prey).

**bifurcata** (Fox). South. Calif.; Mexico (Baja California, Sonora).

*Stictiella bifurcata* Fox, 1923. Calif. Acad. Sci., Proc. (4) 12: 431. ♂.

*Stictiella bifurcata* var. *albicera* Fox, 1923. Calif. Acad. Sci., Proc. (4) 12: 432. ♂.

*Stictiella directa* Fox, 1923. Calif. Acad. Sci., Proc. (4) 12: 433. ♂, ♀.

**bituberculata** (Parker). Ariz., Calif., N. Mex.

*Stictiella bituberculata* Parker, 1917. U. S. Natl. Mus., Proc. 52: 36. ♂, ♀.

**clypeata** (Gillaspay). West. Tex. to south. Calif.; Mexico (Chihuahua, Coahuila, Guerrero). Prey: *Apicocera augur* O. S.; *Tubifera latifrons* (Lw.).

*Stictiella clypeata* Gillaspay, 1959. Pan-Pacific Ent. 35: 187. ♂, ♀.

Biology: Painter, 1936. Kans. Univ. Sci. Bul. 24: 192 (prey; misdet. as *tenuicornis* (Fox)).

— Gillaspay, Evans and Lin, 1962. Ent. Soc. Amer., Ann. 55: 563 (prey).

*gilva* Gillasp. Ariz., Calif. Ecology: Nests in dry sand, provisions progressively. Prey:

*Aphoebantus interruptus* Coq., *A. sp.*

*Glenostictia gilva* Gillasp., 1963. Ent. News 74: 198. ♂, ♀.

Biology: Evans, 1966. Compar. ethology and evolution of sand wasps, pp. 188-189 (nest, prey). —Alcock, 1975. Southwest. Nat. 20: 339 (nest, prey).

**megacera** (Parker). Colo., Utah, Wash.; Mexico.

*Stictiella megacera* Parker, 1917. U. S. Natl. Mus., Proc. 52: 49. ♂, ♀.

**pictifrons** (Smith). Generally distributed from Pa. and Ga. west to Colo., Tex., and Calif. Prey:

*Villa sp.* in *lateralis* Say group.

*Monedula pictifrons* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 335. ♀.

*Monedula inermis* Handlirsch, 1890. Akad. Wiss. Wien, Math.-Nat. Kl., Sitzber. 99: 144. ♂.

*Monedula denverensis* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 235. ♀.

Biology: Gillasp., Evans and Lin, 1962. Ent. Soc. Amer., Ann. 55: 563-564 (prey). —Alcock, 1975. Southwest. Nat. 20: 339-340 (prey-hunting behavior).

**pulla** (Handlirsch). Western U. S. Ecology: Nests in sand, practices progressive provisioning.

Parasite: Miltogrammini sp. Prey: *Lepidanthrax sp.*, *Geron sp.*, *Aphoebantus sp.*;

*Psiloecephala aldrichi* Coq.; *Eupeodes volucris* O. S., *Helophilus latifrons* O. S.;

*Hylemya cilicrura* (Rond.); *Senotainia rubriventris* (Macq.), *Sarcophaga opifera* Coq., *S. tuberosa* Pand., *S. sp.*; *Stomatomyia parvipalpis* (Wulp).

*Monedula pulla* Handlirsch, 1890. Akad. Wiss. Wien, Math.-Nat. Kl., Sitzber. 99: 149. ♀.

*Monedula usitata* Fox, 1895. Acad. Nat. Sci. Phila., Proc. 47: 371. ♂ (♀ misdet.).

Taxonomy: Evans and Lin, 1956. Amer. Ent. Soc., Trans. 82: 52, figs. 63-65 (larva).

Biology: LaRivers, 1942. Pan-Pacific Ent. 18: 4-8 (nest, prey, parasite). —Gillasp., Evans and Lin, 1962. Ent. Soc. Amer., Ann. 55: 564 (nest, prey, sleeping aggregation). —Evans, 1966.

Compar. ethology and evolution of sand wasps, pp. 186-188, fig. 105 (nest, prey).

**scitula** (Fox). Ariz., Calif., N. Mex., Tex. Ecology: Nests in sandy loam or heavier stony soil, makes 5 or more cells per nest, may store as many as 40 prey per cell, provisions progressively. Parasite: *Parnopes concinnus* Vier.?

*Senotainia sp.*? Prey: Cicadellidae

*sp.*; *Heteropsylla texana* Cwfd.; *Neurocolpus arizonae* Knight, *Psallus sp.*; *Procladius*

*sp.* near *bellus* Lw.; *Dicyphoma schaefferi* Coq., *Zabrachia sp.*; *Silvius quadrivittatus*

Say; *Mythicomya intermedia* Mel., *Oligodranes sp.*, *Phthiria sp.*; *Brevitrichia griseola*

Coq., *Scenopinus sp.*; *Holopogon phaeonotus* Lw., *Asilidae sp.*; *Allograpta obliqua* Say,

*Mesograpta marginata* Say; *Euxesta magdalenae* Cr., *E. nitidiventris* Lw.; *Trupanea*

*bisetosa* Coq.; *Conioscinella sp.*; *Melanagromyza sp.*; *Astiosoma sp.*; *Milichia aethiops*

Mall.; *Calythea micropteryx* Thom., *Hylemya platura* Meig., *Pegomya longimana* Pok.;

*Haematobia irritans* L., *Musca domestica* L.; *Eumacronychia sp.*; *Siphophyto setigera*

Coq.; *Apanteles sp.*; *Torymus sp.*; *Iridomyrmex pruinosus* Rog.; *Lindenius sp.*;

*Tachysphex sp.*; *Colletes sp.*; *Perdita exclamans* Ckll., *P. knulli* Timb., *P. marcialis*

Ckll., *P. mentzelianum* Ckll., *P. larreae* Ckll., *P. n. numerata* Ckll., *P. spp.*; *Dufourea sp.*,

*Lasioglossum sp.*; preferred prey are *Perdita* bees, but other small Hymenoptera,

Diptera and Hemiptera are also used.

*Monedula scitula* Fox, 1895. Acad. Nat. Sci. Phila., Proc. 47: 369. ♀.

*Monedula villosa* Fox, 1895. Acad. Nat. Sci. Phila., Proc. 47: 370. ♂.

Taxonomy: Evans, 1964. Amer. Ent. Soc., Trans. 90: 262, figs. 48-52 (larva).

Biology: Gillasp., Evans and Lin, 1962. Ent. Soc. Amer., Ann. 55: 564-566 (nest, prey, sleeping aggregation). —Evans, 1966. Compar. ethology and evolution of sand wasps, pp. 189-205, figs. 106-109 (nest, prey transport, egg, cocoon, life cycle, parasite).

**tenuicornis** (Fox). Calif., Ariz., Tex.

*Monedula tenuicornis* Fox, 1895. Acad. Nat. Sci. Phila., Proc. 47: 368. ♀, ♂.

**terlinguae** Fox. Tex.

*Stictiella terlinguae* Fox, 1928. Pan-Pacific Ent. 4: 103. ♂, ♀.

#### Genus XEROSTICTIA Gillasp

*Xerostictia* Gillasp., 1963. Ent. News 74: 187.

Type-species: *Xerostictia longilabris* Gillasp. Orig. desig.

The genus contains only one polytypic species occurring in the southwestern deserts of the Nearctic Region.

**longilabris longilabris** Gillasp. Ariz., Calif. Ecology: Makes a multicelled nest in sand dunes, practices progressive provisioning. Prey: *Brachynemurus longipalpis* Hag. adults; *Ormenis saucia* Van D. adults. Another subspecies occurs in Baja California.

*Xerostictia longilabris longilabris* Gillasp., 1963. Ent. News 74: 187, figs. 1-7. ♀, ♂.

Biology: Alcock, 1975. Southwest. Nat. 20: 340-341, figs. 3-5 (nest, prey).

### Genus STENIOLIA Say

*Steniolia* Say, 1837. Boston Jour. Nat. Hist. 1: 367.

Type-species: *Bembex*(!) *longirostra* Say. Monotypic.

All but three species occur in western America north of Mexico; two of the extralimital species range as far south as Venezuela or Ecuador. The wasps nest in small aggregations, construct shallow unicellular nests and practice progressive provisioning. Preferred prey of most species are bee-flies (Bombyliidae). The egg is laid on the first prey brought into the nest. Adults of both sexes form large sleeping aggregations on shrubs or plants, often at some distance from the nesting site.

Revision: Gillasp., 1964. Amer. Ent. Soc., Trans. 89: 1-117, 6 pls.

Biology: Evans and Gillasp., 1964. Amer. Midland Nat. 72: 257-280, 14 figs. (comparative ethology).

**californiensis** Gillasp. Calif.; Mexico (Baja California).

*Steniolia californiensis* Gillasp., 1964. Amer. Ent. Soc., Trans. 89: 52, figs. 5, 10, 25, 29, 34, 50. ♂, ♀.

**dissimilis** Fox. Southern Ariz.; Mexico (Sonora, Sinaloa).

*Steniolia dissimilis* Fox, 1923. Calif. Acad. Sci. Proc. (4) 12: 429. ♂, ♀.

**duplicata** Provancher. Western Tex. to Calif., Nev.; Mexico (Baja California, Chihuahua, Coahuila). Ecology: Nests in moderately sandy soil. Parasite: *Parnopes concinnus* Vier.? Prey: *Villa* sp. near *alternata* Say, *V. pallida* (Coq.), *V. spp.*, *Aphoebantus* sp. near *hirsutus* Coq.; *Paragus tibialis* Fall., *Mesogramma marginata* Lw., *Eupeodes volucris* O. S.; Syrphidae spp.; *Fannia* sp.; *Sarcophaga* sp.; Calliphoridae sp.; Syrphidae appear to be the preferred prey.

*Steniolia duplicata* Provancher, 1888. Addit. Corr. Faune Ent. Canada Hym., p. 414. ♂, ♀.

*Steniolia edwardsii* Patton, 1894. Ent. Soc. Wash., Proc. 3: 45. Nom. nud.

*Steniolia meridionalis* Fox, 1923. Calif. Acad. Sci., Proc. (4) 12: 430. ♂.

Taxonomy: Evans, 1964. Amer. Ent. Soc., Trans. 90: 263-264, figs. 34-36 (larva).

Biology: Bradley, 1908. Ent. Soc. Amer., Ann. 1: 129 (sleeping aggregation). — Evans and Gillasp., 1964. Amer. Midland Nat. 72: 274-276 (clustering, nest, prey). — Evans, 1966.

Compar. ethology and evolution of sand wasps, p. 205 (parasite).

**elegans** Parker. Wyo. to Wash., south to western Tex. and southern Calif.; Mexico (Baja California, Sonora, Coahuila, Aguascalientes, San Luis Potosi, Hidalgo). Ecology: Nests in powdery, rocky soil. Prey: *Anthrax irroratus* Say, *Poecilanthrax signatipennis* (Cole), *Systoechus vulgaris* Lw., *Villa sinuosa* Wied., *V. spp.*; *Holopogon atripennis* Back; *Eupeodes volucris* O. S., *Microdon coarctatus* Lw., *Volucella* sp.; Bombyliidae are the preferred prey.

*Steniolia elegans* Parker, 1929. U. S. Natl. Mus., Proc. 75 (5): 50. ♂.

Taxonomy: Evans and Lin, 1956 Amer. Ent. Soc., Trans. 82: 52, figs. 66-71 (larva).

Biology: Evans and Gillasp., 1964. Amer. Midland Nat. 72: 276 (clustering, nest, prey capture). — Evans, 1973. Great Basin Nat. 33: 29-30 (nest, prey transport).

**eremica** Gillasp. Southern Calif., Ariz., Nev. Prey: *Efferia texana* (Bks.).

*Steniolia eremica* Gillasp., 1964. Amer. Ent. Soc., Trans. 89: 67, figs. 14, 38, 54, 84. ♂, ♀.

Biology: Evans and Gillasp., 1964. Amer. Midland Nat. 72: 276-277 (prey).

- nigripes** Parker. Calif.; Mexico (Baja California). Ecology: Nests in bare desert soil. Prey: *Aphoebantus* sp. near *tardus* Coq., *A. hirsutus* Coq.  
*Steniolia nigripes* Parker, 1917. U. S. Natl. Mus., Proc. 52: 8. ♂.  
 Taxonomy: Evans and Lin, 1956. Amer. Ent. Soc., Trans. 82: 53 (larva).  
 Biology: Gillaspay, 1951. Pan-Pacific Ent. 27: 167-168 (nest, prey, cocoon).
- obliqua** (Cresson). Mont. to N. Mex., west to B. C. and Calif. Ecology: Nests in fine-grained, powdery sandy loam. Parasite: *Parnopes chrysoprasinus* Sm.?, *P. edwardsii* (Cr.); Mutillidae sp.; *Taxigramma heteroneura* (Meig.)?, *Hilarella hilarella* (Zett.)? Prey: *Villa sinuosa jaemickiana* O. S., *V. l. lateralis* Say, *V. a. alternata* (Say), *V. a. nigropecta* Cr., *V. concessor* Coq., *Geron* sp., *Bombylius* sp.; *Pipiza calcarata* Lw.; *Lucilia* sp.; Bombyliidae are the preferred prey.  
*Monedula obliqua* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 469. ♀.  
 Taxonomy: Evans, 1964. Amer. Ent. Soc., Trans. 90: 265, fig. 45 (larva).  
 Biology: Evans and Gillaspay, 1964. Amer. Midland Nat. 72: 266-272, figs. 1-10, 13, 14 (clustering, mating, nest, prey capture and transport, life cycle, cocoon, parasites).  
 —Evans, 1970. Mus. Compar. Zool., Bul. 140: 494-495 (nest, prey, parasites).
- scolopacea albicantia** Parker. B. C. to northern Calif., Idaho.  
*Steniolia albicantia* Parker, 1917. U. S. Natl. Mus., Proc. 52: 12. ♂.  
 Biology: Evans and Gillaspay, 1964. Amer. Midland Nat. 72: 261 (clustering).
- scolopacea scolopacea** Handlirsch. Calif., Nev.; Mexico (Baja California).  
*Steniolia scolopacea* Handlirsch, 1889. Akad. Wiss. Wien, Math.-Nat. Kl., Sitzber. 98: 510. ♂, ♀.
- sulfurea** Fox. Calif.  
*Steniolia sulfurea* Fox, 1901. N. Y. Ent. Soc., Jour. 9: 84. ♂.
- tibialis** Handlirsch. Wash. to Calif., Nev., Idaho. Prey: *Conophorus nigripeunis* (Lw.); *Syrphus* sp.  
*Steniolia tibialis* Handlirsch, 1889. Akad. Wiss. Wien, Math.-Nat. Kl., Sitzber. 98: 513. ♂, ♀.  
 Biology: Evans and Gillaspay, 1964. Amer. Midland Nat. 72: 276 (prey).
- vanduzeei** Gillaspay. Calif., Nev.  
*Steniolia vanduzeei* Gillaspay, 1964. Amer. Ent. Soc., Trans. 89: 62, figs. 13, 37, 53, 83. ♂, ♀.

## Family PHILANTHIDAE

So far as known all members of this family are ground-nesters.

Taxonomy: Evans, 1957. Amer. Ent. Soc., Trans. 83: 79-89, figs. 1-35 (larvae). —Evans, 1959. Amer. Ent. Soc., Trans. 85: 156-157 (larvae). —Menke, 1967. Pan-Pacific Ent. 43: 147-148 (key to genera). —Bohart and Grissell, 1975. Calif. Ins. Survey, Bul. 19: 1-92, 151 figs., 46 maps (Calif. spp. with keys to North American Philanthinae).

Biology: Alcock, 1975. Kans. Ent. Soc., Jour. 48: 532-545, 7 figs. (male mating strategy).

### SUBFAMILY PHILANTHINAE

#### Genus PHILANTHUS Fabricius

*Philanthus* Fabricius, 1790. Skrivt. Natur. Hist. Selsk., v. 1, p. 224.

Type-species: *Philanthus coronatus* Fabricius. Desig. by Shuckard, 1837.  
*Symblephilus* Panzer, 1806. Krit. Rev. Insektenf. Deutschlands, v. 2, p. 171.

Type-species: *Philanthus pictus* Panzer. Desig. by Pate, 1937.  
*Simblephilus* Jurine, 1807. Nouv. Method. Class. Hym. Dipt., p. 185.

Type-species: *Vespa triangulum* Fabricius. Desig. by Morice and Durrant, 1914.  
*Cheilopogonus* Westwood, 1834. Zool. Jour. 5: 441.

Type-species: *Cheilopogonus punctiger* Westwood. Monotypic.  
*Philanthus* Guérin, 1835. Iconogr. Regne Anim., Ins., pl. 71, fig. 8. Lapsus.  
*Anthophilus* Dahlbom, 1844. Hym. Europaea, v. 1, p. 190.

Type-species: *Philanthus politus* Say. Desig. by Ashmead, 1899.

*Chilopogon* Kohl, 1896. K. K. Naturhist. Hofmus., Ann. 11: 329. Emend. of *Cheilopogonus* Westwood.

*Epiphilanthus* Ashmead, 1899. Canad. Ent. 31: 294.

Type-species: *Philanthus solivagus* Say. Orig. desig.

*Pseudanthophilus* Ashmead, 1899. Canad. Ent. 31: 294.

Type-species: *Philanthus ventrilabris* Fabricius. Orig. desig.

*Ocoteles* Banks, 1913. Amer. Mus. Nat. Hist., Bul. 32: 423.

Type-species: *Philanthus sanbornii* Cresson. Orig. desig.

*Ocoteles* Mickel, 1916. Amer. Ent. Soc., Trans. 42: 407. Emend. or lapsus.

This genus occurs in all major zoogeographic regions except The Neotropical and Australian. The preferred prey are bees, sometimes honeybees, but occasionally wasps or even Parasitica may be used, perhaps when there is a shortage of bees.

Revision: Strandtmann, 1946. A Rev. of the N. Amer. Spp. of *Philanthus*, 126 pp., 8 pls.

**albopilosus** Cresson. Rocky Mtn. States east to Tex., Ohio, and Ont.; Mexico (Chihuahua).

Ecology: Makes up to 4 cells per nest with 1-6 accessory burrows per nest, stores 6-10 prey per cell. Parasite: *Phrosinella fulvicornis* Coq. Prey: *Aucistrocerus c. catskill* (Sauss.); *Aphilanthops frigidus* (Sm.); *Minumesa fuscipes* (Pack.); *Oxybelus bipunctatus* Oliv.; *Colletes hyalinus* Prov., *C. simulans armatus* Patt., *C. willistoni* Robt.?; *Andrena robertsonii* D. T.; *Agapostemon angelicus* Kll., *Dialictus imitatus* (Sm.), *D. lineatulus* (Cwfd.), *D. pilosus* (Sm.), *Halictus confusus* Sm., *H. ligatus* Say, *H. rubicundus* Chr., *Lasioglossum leucozonium* (Schr.).

*Philanthus albopilosus* Cresson, 1865. Ent. Soc. Phila., Proc. 5: 91. ♂.

*Philanthus simillimus* Cresson, 1865. Ent. Soc. Phila., Proc. 5: 95. ♀.

Biology: Evans, 1975. Ent. Soc. Amer., Ann. 68: 888-892, 6 figs. (male behavior, nest, prey, parasite).

**arizonicus** Bohart. Ariz. (Maricopa Co.).

*Philanthus arizonicus* Bohart, 1972. Ent. Soc. Wash., Proc. 74: 397, fig. 1. ♂.

**barbatus** Smith. Idaho and Oreg. to Colo. and N. Mex.; Mexico (Chihuahua to Puebla). Ecology:

Nests in sand dune. Prey: *Agapostemon melliventris* Cr.; *Exomalopsis sidae* Ckll.

*Philanthus barbatus* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 473. ♂.

*Philanthus albifrons* Cresson, 1865. Ent. Soc. Phila., Proc. 5: 101. ♂, ♀.

*Philanthus henricus* Dunning, 1898. Canad. Ent. 30: 153. ♀.

Biology: Evans and Lin, 1959. Wasmann Jour. Biol. 17: 128 (nest, prey).

**barbiger** Mickel. Colo., Nebr.

*Philanthus barbiger* Mickel, 1916. Amer. Ent. Soc., Trans. 42: 405. ♂, ♀.

**bicinctus** (Mickel). Colo., Utah, Wyo. Ecology: Nests in aggregations, makes very deep nest in friable, clay-silt soil, stores 5 prey per cell. Parasite: *Metopia argyrocephala* (Meig.) ?

Prey: *Bombus bifarius* Cr., *B. occidentalis* Gr., *B. fervidus* (F.), *B. melanopygus* Nyl., *B. flavifrons* Cr., *B. mixtus* Cr., *B. rufocinctus* Cr., *B. centralis* Cr.; preys on bumblebee workers and males.

*Ocoteles bicinctus* Mickel, 1916. Amer. Ent. Soc., Trans. 42: 407. ♀.

*Ocoteles hirticulus* Mickel, 1918 (1917). Nebr. Univ. Studies 17: 326. ♂.

Taxonomy: Evans, 1964. Amer. Ent. Soc., Trans. 90: 275-276, figs. 65-67 (larva).

Biology: Armitage, 1965. Kans. Ent. Soc., Jour. 38: 89-100, 4 figs. (nest, prey). — Evans, 1970. Mus. Compar. Zool., Bul. 140: 500 (nest, prey, parasite ?).

**bilunatus** Cresson. East. U. S. west to N. Dak., Colo., and N. Mex., east. Canad. provinces west

to Alta. Ecology: Nests in flat sand or vertical sand banks, makes 3 or more cells per nest, stores 7-8 small bees per cell. Prey: *Hylaeus m. modestus* Say; *Halictus ligatus* Say, *H. confusus* Sm., *Lasioglossum leucozonium* (Schr.), *Dialictus inconspicuus* (Sm.), *Augochlora striata* Prov.

*Philanthus bilunatus* Cresson, 1865. Ent. Soc. Phil., Proc. 5: 97. ♂.

*Philanthus scelestus* Cresson, 1879. Amer. Ent. Soc., Trans. 7: Proc., p. xxxiii. ♀.

*Philanthus assimilis* Banks, 1915. Canad. Ent. 47: 404. ♂. Preocc.

*Philanthus consimilis* Banks, 1923. Canad. Ent. 55: 21. N. name. Preocc.

Taxonomy: Evans, 1957. Amer. Ent. Soc., Trans. 83: 83, fig. 19 (larva).

Biology: Evans and Lin, 1959. Amer. Midland Nat. 17: 126-127, figs. 4, 5, 9 (nest, prey, egg, life cycle).

**crabroniformis** Smith. Rocky Mt. and Pacific Coast States, N. Dak., Alta., B. C. Ecology:

Nests in rather diffuse aggregations in hard stony soil, usually makes only one nest during lifetime of an individual female containing up to 15 cells, stores 12-24 small prey per cell. Parasite: *Senotainia trilineata* (Wulp), *Phrosinella pilosifrons* Allen, *Metopia argyrocephala* (Meig.) ? Prey: *Astata bakeri* Parker, *A. nubecula* Cr.; *Plenoculus davisi* Fox; *Ectemnius* sp.; *Hylaues affinis* (Sm.), *H.* sp.; *Andrena alboscata* Ckll., *A.* spp., *Perdita fallax* Ckll.; *Agapostemon texanus* Cr., *Dialictus incompletus* (Cwfd.), *D. laevis* (Sm.), *D.* spp., *Erylaues cooleyi* (Cwfd.), *E. niger* (Vier.), *E. peraltus* (Ckll.), *E. synthridis* (Ckll.), *Halictus confusus* (Sm.), *H. farinosus* (Sm.), *H. rubicundus* Chr., *H. tripartitus* Ckll., *Sphecodes patruelis* Ckll., *S. sulcatulus* Ckll., *S.* spp.; *Apis mellifera* L.; small bees are the preferred prey.

*Philanthus crabroniformis* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 474. ♂.

*Philanthus flavifrons* Cresson, 1865. Ent. Soc. Phila., Proc. 5: 102. ♀.

*Philanthus sublimis* Cresson, 1879. Amer. Ent. Soc., Trans. 7: Proc., p. xxxii. ♂.

*Philanthus californicus* Cresson, 1879. Amer. Ent. Soc., Trans. 7: Proc., p. xxxii. ♂.

*Liris magnifica* Provancher, 1895. Nat. Canad. 22: 130. ♂.

Biology: Bohart, 1954. Ent. Soc. Wash., Proc. 56: 26-27 (prey). — Evans, 1970. Mus. Compar. Zool., Bul. 140: 489-499 (nest, prey). — Alcock, 1974. Jour. Zool. 173: 233-246, 2 figs., 3 pls. (nest, prey capture and transport, mating, parasite, competition with *P. gibbosus* (F.)).

**crotoniphilus** Viereck and Cockerell. Calif., N. Mex., Tex.; Mexico (Coahuila).

*Philanthus crotoniphilus* Viereck and Cockerell, 1904. N. Y. Ent. Soc., Jour. 12: 145. ♂.

**gibbosus** (Fabricius). Transcont. in south. Canada and U. S.; Mexico to El Salvador. Ecology:

Nests in flat or vertical soil of types varying from sandy loam to compacted heavy soil, makes 7-15 or more cells per nest, stores 8-16 small prey per cell; rarely 2 females may utilize a joint burrow; 1 female may nest in parental burrow; males frequently occupy parental burrow for life. Parasite: *Metopia argyrocephala* (Meig.), *Hilarella hilarella* (Zett.), *Senotainia trilineata* (Wulp) complex; *Dasymutilla nigripes* (F.) ?, *Sphaerophthalma* sp. Prey: *Crossocerus sulcus* (Fox); *Colletes tucsonensis* Ckll.; *Agapostemon virescens* (F.), *Augochlora pura* (Say), *Augochlora striata* (Prov.), *A.* sp., *Augochloropsis cuprea* (Sm.), *A. m. metallica* (F.), *Dialictus euryceps* (Ellis), *D. incompletus* (Cwfd.), *D. imitatus* (Sm.), *D. laevis* (Sm.), *D. lineatulus* (Cwfd.), *D. microlepidus* (Ellis), *D. obscurus* (Robt.), *D. pilosus* (Sm.), *D. rohweri* (Ellis), *D. zephyrus* (Sm.), *D.* spp., *Halictus confusus* Sm., *H. ligatus* Say, *H. tripartitus* Ckll., *Lasioglossum coriaceum* (Sm.), *L. zonulum* (Sm.), *Sphecodes arvensis* Patt., *S.* spp. Predator: *Diogmites discolor* Lw.; *Misumena calycina* (L.).

*Vespa gibbosus* Fabricius, 1775. Systema Ent., p. 370.

*Philanthus punctatus* Say, 1824. In Keating, Narr. Long's 2nd Exped., v. 2, app., p. 342. ♂.

*Cheilopogonus punctiger* Westwood, 1835. Zool. Jour. 5: 441. ♂, ♀.

*Anthophilus gibbosus* Dahlbom, 1844. Hym. Europaea, v. 1, pp. 192, 497. ♂, ♀. Preocc.

*Anthophilus nodosus* Klug, 1846. Akad. Wiss. Berlin. Ber. Verh., p. 42. Lapsus.

*Philanthus xanthostigma* Cameron, 1891. Biol. Cent.-Amer., Hym., v. 2, p. 131, pl. 8, fig. 12. ♀, ♂.

*Philanthus maculifrons* Cameron, 1891. Biol. Cent.-Amer., Hym., v. 2, p. 132, pl. 8, fig. 13. ♂.

*Philanthus punctatus* var. *cockerelli* Dunning, 1897. Ent. News 8: 69. ♂.

*E. punctatus* var. *chilopsidis* Cockerell, 1898. Davenport Acad. Nat. Sci., Proc. 7: 141. ♀.

The *E.* presumably refers to *Epiphilanthus* inasmuch as this new var. was mentioned in a list of *Philanthidae*.

*Anthophilus melanaspis* Cameron, 1905. Amer. Ent. Soc., Trans. 31: 377. ♀.

*Anthophilus maculiventris* Cameron, 1905. Amer. Ent. Soc., Trans. 31: 377. ♀.

Taxonomy: Evans, 1957. Amer. Ent. Soc., Trans. 83: 82, figs. 11-15 (larva).

- Biology:** Peckham and Peckham, 1898. Wis. Geol. Nat. Hist. Survey, Bul. 2: 117-124 (nest, prey). — Rau and Rau, 1918. Wasp studies afield, pp. 109-116 (nest, prey). — Reinhard, 1924. Smithsn. Inst., Ann. Rpt. for 1922, pp. 363-376. — Reinhard, 1929. Witchery of wasps, pp. 92-140, 2 pls., 5 figs. (nest, prey capture, cocoon, life cycle, parasite, predators). — Evans and Lin, 1959. Amer. Midland Nat. 17: 124-125, fig. 3 (nest, prey). — Cazier and Mortenson, 1965. So. Calif. Acad. Sci., Bul. 64: 174-197, figs. 1-4 (nest, prey). — Lin, 1968. Ent. Soc. Wash., Proc. 70: 10-12 (sleeping behavior). — Evans 1973. Anim. Behaviour 21: 302-308, 3 figs. (burrow sharing, nest transfer). — Barrows and Snyder, 1974 (1973). Ent. News 84: 314-316 (prey, parasite). — Alcock, 1974. Jour. Zool. 173: 241-246 (nest, prey transport, competition with *P. crabroniformis*).
- Morphology:** Snodgrass, 1941. Smithsn. Inst., Misc. Collect. 99 (14): pl. 20, figs. C-E (male genitalia).
- gloriosus** Cresson. Alta., Ariz., Kans., Nebr., N. Dak., N. Mex., Tex.; Mexico (Chihuahua). *Philanthus gloriosus* Cresson, 1865. Ent. Soc. Phila., Proc. 5: 86. ♀.  
*Philanthus insignatus* Banks, 1913. Amer. Mus. Nat. Hist., Bul. 32: 421. ♀.
- inversus** Patton. Great Plains, Iowa, and Kans., north to Alta. and N. Dak., Calif. *Philanthus inversus* Patton, 1879. U. S. Geol. and Geog. Survey, Bul. 5: 355. ♀.
- lepidus** Cresson. East. U. S. west to Tex. and Colo. Ecology: Nests in large aggregations in sand banks, makes 1-5 false burrows and 2 or more cells per nest, stores 9-11 small bees per cell. Parasite: *Senotainia trilineata* (Wulp) complex? Prey: *Pseudopanurgus andrenoides* (Sm.), *Augochlora pura* (Say), *Augochlorella striata* (Prov.), *Dialictus apertus* (Sandh.), *D. cressonii* (Robt.), *D. inconspicuus* (Sm.), *D. laevissimus* (Sm.), *D. tegularis* (Robt.), *D. versans* (Lov.), *D. spp.*, *Evyllaes divergenoides* Mitch., *E. macoupinensis* (Robt.), *Halictus ligatus* Say.  
*Philanthus lepidus* Cresson, 1865. Ent. Soc. Phila., Proc. 5: 92. ♂.  
*Philanthus carolinensis* Banks, 1913. Amer. Mus. Nat. Hist., Bul. 32: 422. ♀.  
*Philanthus carolinensis* var. *reductus* Banks, 1921. Ent. Soc. Amer., Ann. 14: 18. ♂, ♀.
- Biology:** Evans, 1964. Psyche 71: 142-149, 4 figs. (nest, prey, parasite ?).
- levini** Bohart. South. Calif. *Philanthus levini* Bohart, 1972. Ent. Soc. Wash., Proc. 74: 398, fig. 2. ♂, ♀.
- multimaculatus** Cameron. Rocky Mt. States, Alta., B. C.; Mexico (Veracruz). Ecology: Nests in slopes or vertical banks of dry sandy soil or mixture of sand, earth and clay, makes up to 5 cells per nest, stores up to 8 small bees per cell. Parasite: *Dasyntilla dilucida* Mick.; *Senotainia trilineata* (Wulp) complex? Prey: *Dialictus clematisellus* (Ellis), *D. microlepidoides* (Ellis), *D. perparvus* (Ellis), *D. pruinosiformis* (Cwfd.), *D. sp.*, *Sphecodes* spp.  
*Philanthus multimaculatus* Cameron, 1891. Biol. Cent.-Amer., Hym., v. 2, p. 133, pl. 8, fig. 14. ♂.  
*Philanthus anna* Dunning, 1897. Ent. News 8: 68. ♂.  
*Philanthus multiannulatus* Dalla Torre, 1897. Cat. Hym., v. 8, p. 488. Lapsus.  
*Philanthus cleomae* Dunning, 1898. Canad. Ent. 30: 152. ♀.  
*Philanthus annae*(!) Dunning, 1898. Canad. Ent. 30: 154.  
*Philanthus subversus* Banks, 1915. Canad. Ent. 47: 405. ♀.  
*Philanthus yakima* Banks, 1919. Canad. Ent. 51: 85. ♀.
- Biology:** Cazier and Mortenson, 1965. So. Calif. Acad. Sci., Bul. 64: 197-202, fig. 1 (nest, prey, parasites ?). — Alcock, 1975. Amer. Midland Nat. 93: 222-226, 2 figs. (nesting behavior). — Alcock, 1975. Anim. Behaviour 23: 889-895, 4 figs. (male territoriality and mating).
- nasalis** Bohart. Calif. (Contra Costa Co.). *Philanthus nasalis* Bohart, 1972. Ent. Soc. Wash., Proc. 74: 401, figs. 5, 6. ♂, ♀.
- neomexicanus** Strandtmann. Calif., Ariz., N. Mex. *Philanthus neomexicanus* Strandtmann, 1946. A Rev. of the N. Amer. Spp. of *Philanthus*, p. 51. ♂, ♀.
- occidentalis** Strandtmann. Calif. *Philanthus occidentalis* Strandtmann, 1946. A Rev. of the N. Amer. Spp. of *Philanthus*, p. 64. ♂, ♀.

- pacificus arizonae** Dunning, Wyo. to Ariz. and Calif.; Mexico. Ecology: Nests in fine-grained alluvial sand, usually in a colony of only a few individuals, makes up to 3 cells per nest, and stores 8-15 quite small prey per nest. Parasite: *Senotainia trilineata* (Wulp)?, Prey: *Diplazon laetatorius* (F.); *Chelonus texanus* Cr.; Chrysididae sp.; *Stenodynerus valliceps* Boh.; *Diodontus ater* (Mick.), *D. gillettei* Fox, D. sp., *Passaloecus relativus* Fox, Pseninae sp.; *Solierella blaisdelli* (Bridw.); *Lindenus columbianus* (Kohl); *Hylaeus* sp.; *Perdita fallax* Ckll., *P. interserta ciliata* Timb.; *Dialictus incompletus* (Cwfd.), *D. laevis* (Sm.), *D. ruidosensis* (Ckll.), *D. tegulariformis* (Cwfd.), *D. spp.*, *Dufourea scabricornis* Boh., *Erylaeus niger* (Vier.), *E. singularis* (Ckll.), E. sp., *Halictus confusus* Sm., *H. ligatus* Say, *H. tripartitus* Ckll., *Sphecodes* spp.  
*Philanthus arizonae* Dunning, 1898. Canad. Ent. 30: 155. ♂.  
*Anthophilus hirticeps* Cameron, 1905. Amer. Ent. Soc., Trans. 31: 376. ♂.  
*Philanthus assimilis* Banks, 1913. Amer. Mus. Nat. Hist., Bul. 32: 422. ♀.
- Biology: Powell and Chemsak, 1959. Kans. Ent. Soc., Jour. 32: 115-120 (nest, prey; misdet. as *politus pacificus* Cr.). — Evans, 1970. Mus. Compar. Zool., Bul. 140: 501 (nest, prey, parasite ?; misdet. as *pacificus* Cr.).
- pacificus pacificus** Cresson, Nev.  
*Philanthus pacificus* Cresson, 1879. Amer. Ent. Soc., Trans. 7: Proc., p. xxxii. ♂.
- politus** Say, East. U. S. and southeast. Canada. Ecology: Nests in flat or slightly sloping, bare sandy soil, makes up to 4 cells per nest, stores 9-18 small bees per cell. Prey: *Hylaeus m. modestus* Say, *H. verticalis* (Cr.), *H. ziziae* (Robt.), *H. sp.*; *Calliopsis andreiformis* Sm.; *Augochlorocella aurata* (Sm.), *A. striata* (Prov.), *Dialictus albipennis* (Robt.), *D. cressoni* (Robt.), *D. imitatus* (Sm.), *D. lineatulus* (Cwfd.), *D. p. pilosus* (Sm.), *D. spp.*, *Erylaeus macoupinensis* (Robt.), *Halictus c. confusus* Sm.  
*Philanthus politus* Say, 1824. In Keating Narr. Long's 2nd Exped., v. 2, app., p. 343.  
*Philanthus dubius* Cresson, 1865. Ent. Soc. Phila., Proc. 5: 96. ♂.  
*Philanthus texanus* Banks, 1913. Amer. Mus. Nat. Hist., Bul. 32: 422. ♀, ♂.
- Taxonomy: Evans, 1957. Amer. Ent. Soc., Trans. 83: 84, fig. 20 (larva).
- Biology: Evans and Lin, 1959. Amer. Midland Nat. 17: 116-120, figs. 1, 2 (nest, prey transport).
- psyche** Dunning, Iowa to Tex., west to N. Mex., Utah, and Mont., Alta.; Mexico (Chihuahua).  
*Philanthus psyche* Dunning, 1896. Ent. News 7: 287. ♀.  
*Philanthus punctinudus* Viereck and Cockerell, 1904. N. Y. Ent. Soc., Jour. 12: 144. ♂.  
*Philanthus hermosus* Banks, 1913. Amer. Mus. Nat. Hist., Bul. 32: 421. ♀.
- puleher** Dalla Torre, Southwest. States, Wyo., Calif., Alta. Ecology: Nests in large, dense aggregations in hard-packed clay-loam, makes up to 6 cells per nest, stores 6-14 small to medium-sized prey per cell. Parasite: *Senotainia trilineata* (Wulp), *Phrosinella fulvicornis* Allen. Prey: *Scelio* sp.; *Chrysura pacifica* (Say), *Elampus viridicyaneus* Nort., *Hedychridium fletcheri* Bod., *Holopyga ventralis* (Say), *Omalus aeneus* (F.); *Ancistrocerus c. catskill* (Sauss.), *Stenodynerus papagorum* (Vier.), *Symmorphus canadensis* (Sauss.); *Diodontus argentiniae* Roh., *D. gillettei* Fox, D. sp., *Mimesa uncinata* Cr., *Mimusesa mixta* (Fox), *Passaloecus cuspidatus* Sm., *P. relativus* Fox, P. sp.; *Plenoculus davisi* Fox, *Tachysphex aethiops* Cr., *T. nigror* Fox, *T. tarsatus* (Say), T. sp., *Trypoxylon aldrichi* Sandh.; *Belomicrus forbesii* Robt., *Crabro florissantensis* Roh., *Ectemnius dives* (Lep. and Br.), *Lindenus columbianus* (Kohl), *Oxybelus uniglutinis* (L.); *Dienoplus pictifrons* Fox; *Colletes nigrifrons* Tit., *Hylaeus basalis* (Sm.), *H. conspicuus* (Metz), *H. ellipticus* (Kby.); *Andrena melanochroa* Ckll., *Panurginus atriceps* (Cr.), *P. cressoniellus* Ckll., *Perdita wyomingensis* Ckll.; *Dialictus laevis* (Sm.), *D. ruidosensis* (Ckll.), D. spp., *Dufourea maura* (Cr.), *D. scabricornis* Boh., *Erylaeus niger* (Vier.), *Halictus confusus* Sm., *H. tripartitus* Ckll., *Sphecodes* spp.; *Formicapis clypeata* Slad., *Hoplitis producta* (Cr.), *Osmia pentstemonis* Ckll., O. spp., *Stelis lateralis* Cr.; *Nomada* spp.  
*Philanthus pulehellus* Cresson, 1865. Ent. Soc. Phila., Proc. 5: 93. ♂. Preoce.  
*Philanthus puleher* Dalla Torre, 1897. Cat. Hym., v. 8, p. 489. N. name.  
*Philanthus clarconis* Viereck, 1906. Amer. Ent. Soc., Trans. 32: 206. ♀.



- Biology: Evans, 1966. Great Basin Nat. 26: 35-38 (nest, prey, parasite). — Evans, 1970. Mus. Compar. Zool., Bul. 140: 496-498 (nest, prey, parasites).
- sanbornii** Cresson. Ont., New England States south to N. J. and west to Man. and N. Mex.  
Ecology: Nests in small aggregations in flat sand covered with grass. Prey: *Agapostemon radiatus* (Say), *Lasioglossum forbesii* (Robt.); *Apis mellifera* L.; worker honeybees are the preferred prey.  
*Philanthus sanbornii* Cresson, 1865. Ent. Soc. Phila., Proc. 5: 89. ♂, ♀.  
*Philanthus scutellaris* Cresson, 1879. Amer. Ent. Soc., Trans. 7: Proc., p. xxxiv. ♂.  
*Philanthus eurynome* Fox, 1890. Ent. News 1: 107. ♀.  
*Philanthus trumani* Dunning, 1897. Ent. News 8: 70. ♀.  
*Philanthus magdalenae* Strandtmann, 1946. A Rev. of the N. Amer. Spp. of *Philanthus*, p. 39. ♀.
- Biology: Evans, 1955. Brooklyn Ent. Soc. Bul. 50: 47 (nest, prey). — Evans and Lin, 1959. Amer. Midland Nat. 17: 128-129 (nest, prey).
- schusteri** Bohart. South. Calif.  
*Philanthus schusteri* Bohart, 1972. Ent. Soc. Wash., Proc. 74: 402, fig. 4. ♂, ♀.
- serrulatae** Dunning. Southwest. States; Mexico (Sonora).  
*Philanthus serrulatae* Dunning, 1898. Canad. Ent. 30: 154. ♀.
- siouxensis** Mickel. Great Plains and Rocky Mt. States; Mexico (Chihuahua, Coahuila).  
*Philanthus siouxensis* Mickel, 1916. Amer. Ent. Soc., Trans. 42: 406. ♀.
- solivagus** Say. Northeast. States south to Va. and west to Wis., southeast. Canada. Ecology: Nests in flat to slightly sloping sand, makes up to 6 or more cells per nest, stores 6-14 prey per cell. Parasite: *Senotainia trilineata* (Wulp), *Phrosinella fulvicornis* Coq.? Prey: *Ancistrocerus c. catskill* (Sauss.), *A. c. albophaleratus* (Sauss.), *A. a. adiabatus* (Sauss.); *Ectemnius continuus* (F.), *E. lapidarius* (Panz.), *Lestica i. interrupta* (Lep. and Br.); *Colletes americanus* Cr.; *Andrena asteris* Robt., *A. nubecula* Sm., *A. solidaginis* Robt., *A. subaustialis* Ckll., *A. spp.*; *Agapostemon virescens* (F.), *Augochlora pura* (Say), *Augochlorella aurata* (Sm.), *A. striata* (Prov.), *Augochloropsis cuprea* (Sm.), *Dialictus euryceps* (Ellis), *D. lineatulus* (Cwfd.), *D. oblongus* (Lov.), *D. versans* (Lov.), *Halictus c. confusus* Sm., *H. ligatus* Say, *H. rubicundus* (Chr.), *Lasioglossum coriaceum* (Sm.), *L. leucozonium* (Schr.), *Sphecodes davisii* Robt.; bees are the preferred prey.  
*Philanthus solivagus* Say, 1837. Boston Jour. Nat. Hist. 1: 383. ♂.  
*Philanthus solidagus* (!) Howard, 1901. Insect Book, pl. 3, fig. 31.
- Taxonomy: Evans, 1957. Amer. Ent. Soc., Trans. 83: 83, figs. 16-18 (larva).
- Biology: Ristich, 1956. Ohio Jour. Sci. 56: 271-274 (parasite). — Evans and Lin, 1959. Amer. Midland Nat. 17: 120-124, figs. 6-8 (nest, prey, parasite).
- tarsatus** Smith. Colo., Nebr., Tex.  
*Philanthus tarsatus* Smith, 1908. Nebr. Univ. Studies 8: 356. ♀.
- ventilabris** Fabricius. Generally distributed throughout the U. S. and south. Canada. Ecology: Nests in flat sand, makes accessory burrow, stores up to 8 bees per cell. Prey: *Perdita albipennis* Cr., *P. sp.*; *Dialictus inconspicuus* (Sm.), *D. microlepidoides* (Ellis), *D. pruinosis* (Robt.), *D. versatus* (Robt.), *D. spp.*, *Halictus ligatus* Say, *Lasioglossum sisymbrii* Ckll., *Nomia nevadensis arizonensis* Ckll.  
*Philanthus ventilabris* Fabricius, 1798. Sup. Ent. System., p. 268.  
*Philanthus ventilabris* (!) Fabricius, 1804. Systema Piezatorum, p. 303.  
*Philanthus frontalis* Cresson, 1865. Ent. Soc. Phila., Proc. 5: 99. ♂. Preocq.  
*Liris rugosa* Provancher, 1895. Nat. Canad. 22: 130. ♂.  
*Epiphilanthus ventralis* (!) Ashmead, 1899. Canad. Ent. 31: 296.  
*Philanthus ventralis* (!) Howard, 1901. Insect Book, pl. 3, fig. 33.  
*Philanthus ventilabris* (!) var. *completus* Banks, 1915. Canad. Ent. 47: 406. ♂.
- Biology: Peckham and Peckham, 1905. Wasps, social and solitary, pp. 166-167 (nest, prey). — Rau and Rau, 1918. Wasp studies afield, pp. 116-117 (nest, prey). — Evans and Lin, 1959. Amer. Midland Nat. 17: 127 (nest, prey). — Alcock, 1975. Kans. Ent. Soc., Jour. 48: 541, figs. 6-7 (male mating strategy). — Alcock and Gamboa, 1975. Ariz. Acad. Sci., Jour. 10: 163-164, fig. 4 (nest, prey).

*ventralis* (Mickel). Pacific Coast States.

*Oocletes ventralis* Mickel, 1918 (1917). Nebr. Univ. Studies 17: 328. ♀.

*Philanthus strandtmanni* Burks, 1951. In Muesebeck, U. S. Dept. Agr., Agr. Monog. 2: 1002. N. name proposed unnecessarily.

*zebratus* Cresson. N. Dak., Nebr. and Colo. west to B. C. and Calif. Ecology: Nests in coarse sandy loam, occasionally makes only one nest during a lifetime which may contain up to 17 cells, stores 3-9 large prey per cell. Parasite: *Senotainia trilineata* (Wulp), *Phrosinella pilosifrons* Allen. Prey: *Diphyus* sp., *Dusona* sp., *Eutanyacra* sp., *Ichneumon* sp., *Spilichneumon* sp.; *Ancistrocerus a. adiabatus* (Sauss.), *Euodynerus castigatus* (Sauss.), *Stenodynerus taos* (Cr.), *Symmorphus meridionalis* Vier.; *Pseudomasaris vespoides* Cr.; *Ammophila azteca* Cam., *A. dysmica* Menke, *A. mediata* Cr., *Palmodus carbo* Boh. and Menke, *Podalonia communis* (Cr.), *P. luctuosa* (Sm.); *Astata nubecula* Cr.; *Larropsis capax* (Fox), *Tachysphex aethiops* (Cr.), *T.* sp.; *Crabro latipes* Sm., *C. pleuralis* Fox, *Ectemnius* sp.; *Aphilanthops subfrigidus* Dunn., *Cerceris aequalis idahoensis* Scul., *Eucerceris fulvipes* Cr.

*Philanthus zebratus* Cresson, 1879. Amer. Ent. Soc., Trans. 7: Proc., p. xxxiii. ♂.

*Philanthus basilaris* Cresson, 1879. Amer. Ent. Soc., Trans. 7: Proc., p. xxxiii. ♂, ♀.

*Oocletes nitens* Banks, 1913. Amer. Mus. Nat. Hist., Bul. 32: 423. ♀.

*Oocletes(!) illustris* Mickel, 1918 (1917). Nebr. Univ. Studies 17: 327. ♀.

Biology: Evans, 1966. Great Basin Nat. 26: 38-39, fig. 2 (nest, prey, parasites). — Evans, 1970. Mus. Compar. Zool., Bul. 140: 499-500 (nest, prey, parasites).

### Genus TRACHYPUS Klug

*Trachypus* Klug, 1810. Mag. Gesell. Naturf. Freunde Berlin 4: 41.

Type-species: *Trachypus Gomesii* Klug. Monotypic.

*Simblephilus* Dahlbom. 1844. Hym. Europaea, v. 1, p. 190.

Type-species: *Philanthus petiolatus* Spinola. Monotypic.

*Philanthocephalus* Cameron, 1890. Biol. Cent.-Amer., Hym., v. 2, p. 86.

Type-species: *Philanthocephalus gracilis* Cameron. Desig. by Pate, 1937.

This small genus is essentially Neotropical, but one Mexican species occurs in southern Texas. These wasps also prey upon bees.

*mexicanus* Saussure. South. Tex.; Mexico to Costa Rica. Ecology: Nests in flat sand or limestone rubble, makes multicellular nest, stores up to 6 prey per cell. Prey:

*Augochlora* sp., *Halictus hesperus* Sm.; *Exomalopsis* sp., *Melissodes* sp.

*Trachypus Mexicanus* Saussure, 1867. Reise d. Novara, Zool., v. 2, Hym., p. 86. ♀.

*Philanthocephalus mexicanus* Cameron, 1890. Biol. Cent.-Amer., Hym., v. 2, p. 89, pl. 6, figs. 5, 6. ♀, ♂. Preocc.

*Trachypus annulitarsis* Cameron, 1908. Amer. Ent. Soc., Trans. 34: 232. ♀.

Biology: Evans, 1964. Kans. Ent. Soc., Jour. 37: 303-304 (nest, prey).

### SUBFAMILY APHILANTHOPSINAE

#### TRIBE APHILANTHOPSINI

This tribe occurs only in the Nearctic Region. Its members prey only upon ants, the more primitive *Aphilanthops* on winged queen ants. The other two genera prey upon harvester ant workers and have developed a complex mechanism at the apex of the abdomen which is used in prey transport.

Taxonomy: Bohart, 1966. Ent. Soc. Wash., Proc. 68: 158-167 (review of Nearctic spp.).

Biology: Evans, 1962. Behaviour 19: 239-260, 5 figs. (nesting behavior, prey carriage).

### Genus APHILANTHOPS Patton

*Aphilanthops* Patton, 1881. Boston Soc. Nat. Hist., Proc. 20: 401.

Type-species: *Philanthus frigidus* Smith. Orig. desig.

Winged queen ants of the genus *Formica* are used as prey. The wasps dealate the queens before placing them in the brood cell.

Revision: Dunning, 1898. Amer. Ent. Soc. Trans. 25: 19-26.

*foxi* Dunning. South. Calif. deserts.

*Aphilanthops foxi* Dunning, 1898. Amer. Ent. Soc., Trans. 25: 21. ♂.

**frigidus** (Smith). Transcont., N. S., Que., Wyo. and Wash. south to Va., Mich., N. Mex., Utah and Calif. Ecology: Nests gregariously in pebbly sand, makes up to 4 or more cells per nest, stores 2-3 dealated queen ants per cell. Parasite: *Senotainia trilineata* (Wulp), *Euaraba tergata* (Coq.)? Prey: Winged queens of *Formica fusca* L., *F. pallidefulva nitidiventris* Em., *F. neogagates* Em.

*Philanthus frigidus* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 475. ♂.

*Aphilanthops bakeri* Dunning, 1896. Canad. Ent. 28: 203. ♂.

*Nomada (Holonomada) dawsoni* Swenk, 1912. Nebr. Univ. Studies 12: 83. ♂.

Taxonomy: Evans, 1957. Amer. Ent. Soc., Trans. 83: 81, figs. 1-10 (larva).

Biology: Peckham and Peckham, 1905. Wasps, social and solitary, pp. 167-177, 1 fig. (nest, prey). — Wheeler, 1913. Jour. Anim. Behavior 3: 374-387 (nest, prey). — Ristich, 1956. Ohio Jour. Sci. 56: 271-274 (parasite). — Evans, 1962. Behaviour 19: 240-245, fig. 1a (nest, prey carriage, parasite ?).

**hispidus** Fox. Ariz., south. Calif.; Mexico (Baja California).

*Aphilanthops hispidus* Fox, 1894. Calif. Acad. Sci., Proc. (2) 4: 106. ♂.

**subfrigidus** Dunning. N. Y., Colo., Wyo., Mont., Idaho, B. C., Wash., Oreg., Calif., Nev. Ecology: Nests in compacted soil. Parasite: *Senotainia trilineata* (Wulp)?, *Metopia argyrocephala* (Meig.)? Prey: Winged queens of *Formica neogagates* Em., *F. fusca* L. group. Predator: *Philanthus zebratus* Cr.

*Aphilanthops subfrigidus* Dunning, 1898. Amer. Ent. Soc., Trans. 25: 21. ♂, ♀.

*Aphilanthops elsiae* Dunning, 1898. Amer. Ent. Soc., Trans. 25: 23. ♀.

Biology: Evans, 1962. Behaviour 19: 245 (prey). — Evans, 1970. Mus. Compar. Zool., Bul. 140: 496 (nest, prey, parasites ?).

### Genus CLYPEADON Patton

*Clypeadon* Patton, 1897. Ent. News 8: 13.

Type-species: *Aphilanthops quadrinotatus* Ashmead. Orig. design.

The eight known species occur in the western deserts of the Nearctic Region. Worker harvester ants of the genus *Pogonomyrmex* are used as prey, and each species apparently preys upon only one species of ant. The ant is transported to the nest in a special ant clamp formed by modification of the apex of the abdomen.

**californicus** (Bohart). Calif., Oreg.

*Aphilanthops (Clypeadon) californica* Bohart, 1959. Ent. Soc. Amer., Ann. 52: 108. ♂, ♀.

**dreisbachi** (Bohart). Tex., Okla., Colo.; Mexico (Zacatecas, Jalisco, Nayarit, Queretaro, San Luis Potosi). Prey: Worker ants, *Pogonomyrmex barbatus rugosus* Em.

*Aphilanthops (Clypeadon) dreisbachi* Bohart, 1959. Ent. Soc. Amer., Ann. 52: 107. ♂, ♀.

Biology: Evans, 1962. Behaviour 19: 249 (prey).

**evansi** Bohart. N. Mex., Ariz., Calif. Ecology: Nests in sand dune, makes up to 5 or more cells per nest, stores about 7-12 prey per cell. Parasite: *Senotainia trilineata* (Wulp). Prey: *Pogonomyrmex barbatus rugosus* Em. workers.

*Clypeadon evansi* Bohart, 1966. Ent. Soc. Wash., Proc. 68: 163. ♂, ♀.

Biology: Evans, 1962. Behaviour 19: 248-249, fig. 2 (nest, prey, parasite; det. as *Aphilanthops (Clypeadon)* sp. A). — Alcock and Gamboa, 1975. Ariz. Acad. Sci., Jour. 10: 162-163, fig. 3 (prey capture, nest).

**haigi** (Bohart). Ariz. to west. Tex. Ecology: Nests in small aggregations in sand dunes, makes up to 3 cells per nest, stores up to 14 prey per cell. Parasite: *Miltogrammini* sp.? Prey: *Pogonomyrmex barbatus rugosus* Em. workers.

*Aphilanthops (Clypeadon) haigi* Bohart, 1959. Ent. Soc. Amer., Ann. 52: 106. ♂, ♀.

Biology: Evans, 1962. Behaviour 19: 245-248, figs. 1b, 2, 3, 4b (nest, prey carriage, parasite ?).  
**laticinctus** (Cresson). West. Tex. to east. and south. Calif., north to Colo., Idaho and Oreg.

Ecology: Nests in bare level sand, makes up to 3 cells per nest, stores 15-26 prey per cell. Parasite: *Senotainia* sp. near *trilineata* (Wulp). Prey: *Pogonomyrmex occidentalis* Cr. workers.

*Philanthus laticinctus* Cresson, 1865. Ent. Soc. Phila., Proc. 5: 91. ♂.

*Aphilanthops quadrinotatus* Ashmead, 1890. Colo. Biol. Assoc., Bul. 1: 7. ♀.

Taxonomy: Evans, 1964. Amer. Ent. Soc., Trans. 90: 274-275, figs. 63-64 (larva).

Biology: Hicks, 1927. Canad. Ent. 59: 51-55 (nest, prey carriage, cocoon). — Hicks, 1933. Canad. Ent. 65: 141-144 (nest, prey). — Evans, 1962. Behaviour 19: 250-253 (nest, prey carriage, parasite).

**sculleni** (Bohart). Ariz., Colo., N. Mex., Tex.; Mexico (Chihuahua). Prey: Worker ants, *Pogonomyrmex maricopa barnesi* Sm.

*Aphilanthops (Clypeadon) sculleni* Bohart, 1959. Ent. Soc. Amer., Ann. 52: 107. ♂, ♀.

Biology: Evans, 1962. Behaviour 19: 250 (prey).

**taurus** (Cockerell). Ariz., N. Mex., west. Tex. Prey: Workers of *Pogonomyrmex barbatus rugosus* Em.

*Aphilanthops taurus* Cockerell, 1895. Amer. Ent. Soc., Trans. 22: 293. ♂.

*Aphilanthops (Clypeadon) phoenix* Pate, 1947. Pan-Pacific Ent. 23: 66. ♀.

Biology: Ainslie, 1909. Canad. Ent. 41: 99-100 (prey capture). — Alcock, 1975. Kans. Ent. Soc., Jour. 48: 538-541, fig. 5 (male mating strategy).

**utahensis** (Baker). Southwest. Tex., N. Mex., Ariz., Nev., Utah and south. Calif. in deserts; Mexico (Sonora, Queretaro). Prey: *Pogonomyrmex barbatus* (Sm.) workers.

*Aphilanthops utahensis* Baker, 1895. Canad. Ent. 27: 335. ♂.

*Aphilanthops concinnulus* Cockerell, 1896. Canad. Ent. 28: 221. ♂.

Biology: Evans, 1962. Behaviour 19: 250, fig. 4c (prey).

#### Genus LISTROPYGIA Bohart

*Aphilanthops* subg. *Listropygia* Bohart, 1959. Ent. Soc. Amer., Ann. 52: 106.

Type-species: *Aphilanthops (Listropygia) bechteli* Bohart. Orig. desig.

Only one species is known in this genus. It has an ant clamp at the apex of the abdomen and preys upon worker harvester ants.

**bechteli** (Bohart). South. Calif., Ariz. Prey: Workers of *Pogonomyrmex californicus* Buck.

*Aphilanthops (Listropygia) bechteli* Bohart, 1959. Ent. Soc. Amer., Ann. 52: 106. ♂, ♀.

Biology: Evans, 1962. Behaviour 19: 253, figs. 4c, 5 (prey).

#### SUBFAMILY CERCERINAE

This subfamily contains only two genera, *Cerceris* and *Eucerceris*. The former contains numerous species and occurs in all major zoogeographic regions. The latter genus has comparatively few species, occurs in the New World only as far south as Panama, and the majority of species are Nearctic. So far as known the New World species prey upon Coleoptera only as do most of the Old World species, but a few of the latter are known to prey upon bees, wasps and chalcids.

Biology: Scullen and Wold, 1969. Ent. Soc. Amer., Ann. 62: 209-214 (prey records of spp. in America north of Mexico). — Evans, 1971. Kans. Ent. Soc., Jour. 44: 518, 520-522 (notes on comparative behavior).

#### Genus CERCERIS Latreille

*Cerceris* Latreille, 1802-1803. Hist. Nat. Crust. Ins., v. 3, p. 367.

Type-species: *Philanthus ornatus* Fabricius. Desig. by Latreille, 1810 (= *Sphex rybyensis* Linnaeus).

*Nectanebus* Spinola, 1838. Soc. Ent. France, Ann. 7: 489.

Type-species: *Nectanebus Fischieri* Spinola. Orig. desig.

*Diamma* Dahlbom, 1844. Hym. Europaea. v. 1, p. 225. Preocce.

Type-species: *Diamma Spinolae* Dahlbom. Monotypic (= *Cerceris binodis* Spinola).

*Didesmus* Dahlbom, 1845. Hym. Europaea, v. 1, p. 502. N. name.

*Apiraptrix* Shestakov, 1923. Sbornik Jaroslav Gosudarst. Universitet., p. 101.

Type-species: *Spheg rybyensis* Linnaeus. Orig. desig.

*Paracerceris* Brethes, 1913. Mus. Nac. Hist. Nat. Buenos Aires, An. 24: 127.

Type-species: *Paracerceris tridentifera* Brethes. Monotypic.

*Bucerceris* Minkiewicz, 1934. Polski Pismo Ent. 12: 253.

Type-species: *Cerceris bupresticida* Dufour. Monotypic.

*Stercobata* Gussakovskij, 1935. Acad. Sci. U. R. S. S., Tadzikistan, Trav. 5: 445.

Type-species: *Cerceris bupresticida* Dufour. Monotypic.

*Apicerceris* Pate, 1937. Amer. Ent. Soc., Mem. 9: 8.

Type-species: *Spheg rybyensis* Linnaeus. Orig. desig.

Revision: Scullen, 1965. U. S. Natl. Mus., Proc. 116: 333-548, 182 figs. (spp. of America north of Mexico). — Scullen, 1972. Smithsn. Contrib. Zool. 110: 1-121, 173 figs. (Mexican and Central American spp.).

Taxonomy: Cresson, 1865. Ent. Soc. Phila., Proc. 5: 122-132 (spp. of N. Amer. north of Mexico). — Banks, 1912. Ent. Soc. Amer., Ann. 5: 11-30 (spp. of east. N. Amer.). — Banks, 1947. Psyche 54: 1-35 (West Coast spp.).

**acanthophila** Cockerell. Southwest. U. S.; Mexico (Baja California to Nuevo Leon, south to Hidalgo).

*Cerceris acanthophila* Cockerell, 1897. Entomologist 30: 135. ♂.

*Cerceris cockerelli* Viereck, 1903 (1902). Acad. Nat. Sci. Phila., Proc. 54: 731. ♂.

*Cerceris (Apiratrix?) huachuca* Banks, 1947. Psyche 54: 29. ♂.

**aequalis aequalis** Provancher. Principally Calif. and Oreg., but scattered records in Wash., Wyo., Utah, Ariz., N. Mex., Tex.

*Cerceris aequalis* Provancher, 1888. Addit. Corr. Faune Ent. Canada Hym., p. 417. ♀.

*Cerceris vicinoides* Viereck and Cockerell, 1904. N. Y. Ent. Soc., Jour. 12: 140. "♂" = ♀.

*Cerceris psamathe* Banks, 1912. Ent. Soc. Amer., Ann. 5: 21. ♀.

**aequalis bolingeri** Scullen. Oreg., Nev.

*Cerceris aequalis bolingeri* Scullen, 1965. U. S. Natl. Mus., Proc. 116: 453, figs. 64, 146a, b, c. ♀.

**aequalis idahoensis** Scullen. B. C. to Oreg., Idaho, Wyo., Colo. Predator: *Philanthus zebratus* Cr.

*Cerceris aequalis idahoensis* Scullen, 1965. U. S. Natl. Mus., Proc. 116: 454, figs. 65, 147a, b, c. ♀.

**alceste** Mickel. Nebr. (Mitchell).

*Cerceris alceste* Mickel, 1918 (1917). Nebr. Univ. Studies 17: 333. ♀.

**argia** Mickel. La., Tex. north to Kans. and Colo., west to Ariz.; Mexico (Chihuahua, Nuevo Leon, Jalisco).

*Cerceris argia* Mickel, 1916. Amer. Ent. Soc., Trans. 42: 412. ♀.

Taxonomy: Scullen, 1968. Ent. News 79: 158, figs. 5, 6. ♂.

**arizonella** Banks. Ariz. (Tempe).

*Cerceris arizonella* Banks, 1947. Psyche 54: 32. ♂.

**astarte** Banks. N. H. to N. C. west to Wis., Ill. and northeast. Tex.

*Cerceris astarte* Banks, 1913. Amer. Mus. Nat. Hist., Bul. 32: 424. ♀.

**atramontensis** Banks. Que. to N. C. west to N. Dak. and centr. Tex. Ecology: Nests in woods in stony soil. Prey: *Conotrachelus anaglypticus* Say, *C. naso* LeC., *C. nenuphar* Hbst., *C. posticatus* Boh., *Hyperodes sparsus* Say.

*Cerceris atramontensis* Banks, 1913. Amer. Mus. Nat. Hist., Bul. 32: 425. ♀.

*Cerceris arbuscula* Mickel, 1916. Amer. Ent. Soc., Trans. 42: 410. ♀.

Biology: Krombein, 1956. Brooklyn Ent. Soc., Bul. 51: 43 (nest, prey). — Evans, 1971. Kans. Ent. Soc., Jour. 44: 512-513 (nest, prey).

*azteca* Saussure. Ariz.; Mexico to Argentina.

*Cerceris azteca* Saussure, 1867. Reise d. Novara, Zool., v. 2, Hym., p. 97. ♀.

*Cerceris (Apiratrix(?)) seminigra* Banks, 1947. Psyche 54: 33. ♂. Preocc.

*banksi* Scullen. Mass. to N. C., Ill., Mo., Kans.

*Cerceris banksi* Scullen, 1965. U. S. Natl. Mus., Proc. 116: 461, figs. 70, 152a, b, c. ♀.

*bicornuta* Guerin. Transcont. in U. S., Mass., Mich., S. Dak. and Oreg. south into Mexico

(Coahuila, Chihuahua, Sonora, Baja California, Durango). Ecology: Nests in flat stony

soil or sand, makes its own burrow or extends a pre-existing burrow. Parasite:

*Senotainia kansensis* Tns.?; *Hedychrum violaceum* Br.? Prey: *Eupagoderes* sp.,

*Sphenophorus aequalis* Gyll., *S. criosus* (Oliv.), *S. cultellatus* (Horn), *S. maidis* (Chitt.),

*S. marinus* (Chitt.), *S. parvulus* (Gyll.), *S. pertinax* (Oliv.), *S. venatus* (Say), *S. vestitus*

(Chitt.), *S. zeae* (Walsh).

*Cerceris bicornuta* Guerin, 1844. Iconogr. Regne Anim., Ins., v. 7, p. 443. ♀.

*Cerceris dufourii* Guerin, 1844. Iconogr. Regne Anim., Ins., v. 7, p. 444. ♂.

*Cerceris venator* Cresson, 1865. Ent. Soc. Phila., Proc. 5: 116. ♂.

*Cerceris curvicauda* Cameron, 1890. Biol. Cent.-Amer., Hym., v. 2, p. 124, pl. 8, fig. 3. ♂.

*Cerceris fidelis* Viereck and Cockerell, 1904. N. Y. Ent. Soc., Jour. 12: 132. ♀.

*Cerceris venatrix* Schulz, 1906. Spolia Hym., p. 195. Emend.

Biology: Rau, 1928. Acad. Sci. St. Louis, Trans. 25: 337-341, figs. 35, 36 (nest, prey, parasite ?). — Cartwright, 1929. S. C. Agr. Expt. Sta., Bul. 257: 31 (prey). — Strandtmann, 1945. Ent. Soc. Amer., Ann. 38: 311, fig. 8 (nest, prey). — Krombein, 1953. Ent. Soc. Wash., Proc. 55: 118-119 (nest, prey). — Krombein, 1960. Brooklyn Ent. Soc., Bul. 55: 75-76 (nest, prey, parasite ?). — Evans, 1971. Kans. Ent. Soc., Jour. 44: 513 (prey).

*blakei* Cresson. N. J. to Fla., west to east. Tex., Ill., Kans. Ecology: Makes vertical burrow in flat bare sand, makes 3 or more cells in a completed nest, stores 42-69 very small beetles, mostly weevils, per cell. Parasite: Miltogrammini sp. Prey: *Derolomus basalis* LeC. The most common prey, *Limnobaris confusa* (Boh.), *Autonomus sexguttatus* Dietz, *Hyperodes* sp.; *Graphops floridana* Bl.; *Blapstinus interruptus* (Say).

*Cerceris elegans* Smith, 1856. Cat. Hym. Brit. Mus., v. 5, p. 467. ♂. Preocc.

*Cerceris blakei* Cresson, 1865. Ent. Soc. Phila., Proc. 5: 121. ♀.

*Cerceris elegantissima* Schletterer, 1887. Zool. Jahrb., Ztschr. f. System. 2: 490. N. name.

Biology: Krombein, 1963. Brooklyn Ent. Soc., Bul. 58: 72-79 (nest, prey capture and transport, parasite).

*boharti* Scullen. Ariz., N. Mex.; Mexico (Coahuila).

*Cerceris boharti* Scullen, 1965. U. S. Natl. Mus., Proc. 116: 466, figs. 73, 154a, b, c. ♀.

*bolingeriana* Krombein, n. name. Ariz. (Herford); Mexico (Durango).

*Cerceris bolingeri* Scullen, 1972. Smithsn. Contrib. Zool. 110: 72, figs. 68, 146a, b. ♀. Preocc.

*bridwelli* Scullen. South. Calif. and Ariz.; Mexico (Baja California, Sonora).

*Cerceris bridwelli* Scullen, 1965. U. S. Natl. Mus., Proc. 116: 361, figs. 5, 111a, b, c. ♀, ♂.

*butleri* Scullen. South. Ariz., southwest. Tex.; Mexico (Sonora).

*Cerceris butleri* Scullen, 1965. U. S. Natl. Mus., Proc. 116: 363, figs. 6, 112a, b, c. ♀.

*californica* Cresson. B. C. and Idaho south to Calif. and Ariz., N. Mex., west. Tex.; Mexico

(Baja California to Nuevo Leon south to Queretaro). Parasite: *Dasymutilla coccineohirta* (Bl.); *Metopia argyrocephala* (Meig.), *Amobia floridensis* (Tns.) ?, *Senotainia trilineata* (Wulp) ? Prey: *Acmaeodera acuta* LeC., *A. adenostomae* Caz., *A. agens* Fall, *A. coquillettii* Fall, *A. dohrni* Horn, *A. dolorosa* Fall, *A. fenyesi* Fall, *A. gemina* Horn, *A. hepburni* LeC., *A. holsteni* White, *A. jocosus* Fall, *A. nexa* Fall, *A. perlanosa* Timb., *A. plagiaticauda* Horn, *A. prorsa* Fall, *A. quadriseriata* Fall, *A. sinuata* Van Dyke, *Agilus angelicus* Horn, *A. blaudus* Horn, *A. politus* (Say), *Anthaxia aeneogaster* Cast., *Chrysobothris deleta* LeC., *C. lucana* Horn, *C. femorata* (Oliv.).

*Cerceris californica* Cresson, 1865. Ent. Soc. Phila., Proc. 5: 128. ♂.

*Cerceris ferruginior* Viereck and Cockerell, 1904. N. Y. Ent. Soc., Jour. 12: 134. ♂.

*Cerceris populorum* Viereck and Cockerell, 1904. N. Y. Ent. Soc., Jour. 12: 135. ♂.

*Cerceris garciana* Viereck and Cockerell, 1904. N. Y. Ent. Soc., Jour. 12: 135. ♂.

*Cerceris argyrotiricha* Rohwer, 1908. Canad. Ent. 40: 324. ♀.

- Cerceris cognata* Mickel, 1916. Amer. Ent. Soc., Trans. 42: 408. ♀.  
*Cerceris denticularis* Banks, 1917. Mus. Comp. Zool., Bul. 61: 113. ♀, ♂.  
*Cerceris interjecta* Banks, 1919. Canad. Ent. 51: 84. ♂.  
*Cerceris arno* Banks, 1947. Psyche 54: 19. ♀.  
*Cerceris calodera* Banks, 1947. Psyche 54: 22. ♂.  
*Cerceris illota* Banks, 1947. Psyche 54: 23. ♂.  
*Cerceris isolde* Banks, 1947. Psyche 54: 24. ♂.
- Biology: Linsley and MacSwain, 1956. Ent. Soc. Amer., Ann. 49: 71-84, 3 figs. (nest, prey selection, parasites).
- calochorti calochorti** Rohwer. East slope of Rocky Mts., Alta. south to N. Mex. and Tex.  
 Predator: *Philanthus zebratus* Cr.  
*Cerceris calochorti* Rohwer, 1908. Canad. Ent. 40: 322. ♀.
- calochorti hidalgo** Scullen. Ariz. (Pima Co.); Mexico (Higher elevations south to Mexico City).  
*Cerceris calochorti hidalgo* Scullen, 1972. Smithsn. Contrib. Zool. 110: 75, figs. 71, 149a-e. ♀, ♂.
- carrizonensis** Banks. Tex., (Uvalde).  
*Cerceris carrizonensis* Banks, 1915. Canad. Ent. 47: 403. ♂.
- chilopsidis** Viereck and Cockerell. Southwest. desert area.  
*Cerceris chilopsidis* Viereck and Cockerell, 1904. N. Y. Ent. Soc., Jour. 12: 136. ♀.
- cleomae** Rohwer. Colo. (Denver).  
*Cerceris cleomae* Rohwer, 1908. Canad. Ent. 40: 325. ♂.
- clypeata clypeata** Dahlbom. Maine and Ont. to N. Dak. south to north. Fla. and east Tex.  
 Ecology: Nests in gravelly soil. Parasite: *Dasyneutilla scaevola* (Bl.) ? Prey: *Chalepus dorsalis* Thunb., *Lema trilineata* (Oliv.); *Curculio nasicus* (Say), *Pissodes strobi* (Peck), *Tanymericus confusus* (Say).  
*Cerceris clypeata* Dahlbom, 1844. Hym. Europaea, v. 1, pp. 221, 500. ♂, ♀.  
*Cerceris imitator* Cresson, 1865. Ent. Soc. Phila., Proc. 5: 125. ♂. Preocc.  
*Cerceris imitatoria* Schletterer, 1887. Zool. Jahrb., Ztschr. f. System. 2: 494. N. name.  
*Cerceris chryssipe* Banks, 1912. Ent. Soc. Amer., Ann. 5: 18. ♀, ♂.  
*Cerceris clymene* Banks, 1912. Ent. Soc. Amer., Ann. 5: 20. ♂, ♀.  
*Cerceris zobeide* Brimley, 1929. Ent. News 40: 194. ♂.  
*Cerceris zosma* Brimley, 1929. Ent. News 40: 195. ♂.
- Taxonomy: Evans, 1957. Amer. Ent. Soc., Trans. 83: 86, fig. 31 (larva).
- Biology: Peckham and Peckham, 1898. Wis. Geol. Nat. Hist. Surv., Bul. 2: 109-114 (nest, prey). — Krombein, 1954. Brooklyn Ent. Soc., Bul. 49: 6-7 (nest, prey). — Scullen, 1965. U. S. Natl. Mus., Proc. 116: 471 (prey).
- clypeata dakotensis** Banks. North cent. States.  
*Cerceris dakotensis* Banks, 1915. Canad. Ent. 47: 402. ♀, ♂.
- clypeata gnarina** Banks. Cent. States.  
*Cerceris gnarina* Banks, 1913. Amer. Mus. Nat. Hist., Bul. 32: 237. ♀.
- clypeata prominens** Banks. East. States.  
*Cerceris prominens* Banks, 1912. Ent. Soc. Amer., Ann. 5: 19. ♀, ♂.  
*Cerceris alaope* Banks, 1912. Ent. Soc. Amer., Ann. 5: 22. ♂, ♀.
- cochisi** Scullen. South. Calif., Ariz., N. Mex., Tex.; Mexico (Baja California, Sonora, Zacatecas, San Luis Potosi, Nayarit).  
*Cerceris cochisi* Scullen, 1965. U. S. Natl. Mus., Proc. 116: 416, fig. 39. ♀, ♂.  
*Cerceris cochise* (!) Scullen, 1972. Smithsn. Contrib. Zool. 110: 42.
- compacta** Cresson. East. and cent. States southwest to south. Calif.; Mexico south to Veracruz and Oaxaca. Prey: *Colaspis brunnea* (F.).  
*Cerceris compacta* Cresson, 1865. Ent. Soc. Phila., Proc. 5: 127. ♂, ♀.  
*Cerceris aureo-facialis* Cameron, 1890. Biol. Cent.-Amer., Hym., v. 2, p. 112. ♂.  
*Cerceris solidaginis* Rohwer, 1908. Canad. Ent. 40: 323. ♂.  
*Cerceris belfragei* Banks, 1917. Mus. Compar. Zool., Bul. 61: 114. ♀, ♂.
- Biology: Scullen, 1965. U. S. Natl. Mus., Proc. 116: 420 (prey).

- compar albinota** Scullen. Southwest. Tex., south. Ariz.; Mexico (Chihuahua, Durango).  
*Cerceris compar albinota* Scullen, 1972. *Smithsn. Contrib. Zool.* 110: 60, figs. 53, 137a-e. ♀, ♂.
- compar compar** Cresson. Maine to S. Dak., south to Fla. and N. Mex.; Mexico (Guanajuato).  
*Cerceris compar* Cresson, 1865. *Ent. Soc. Phila., Proc.* 5: 126. ♂.  
*Cerceris jucunda* Cresson, 1872. *Amer. Ent. Soc., Trans.* 4: 231. ♂.  
*Cerceris catawba* Banks, 1912. *Ent. Soc. Amer., Ann.* 5: 25. ♀, ♂.  
*Cerceris jucunda* var. *carolina* Banks, 1912. *Ent. Soc. Amer., Ann.* 5: 26. ♂.
- compar geniculata** Cameron. South. Ariz. to north. Guatemala.  
*Cerceris geniculata* Cameron, 1890. *Biol. Cent.-Amer., Hym.*, v. 2, p. 113, pl. 7, fig. 7. ♀.  
*Cerceris feralis* Cameron, 1890. *Biol. Cent.-Amer., Hym.*, v. 2, p. 113. ♂.
- compar orestes** Banks. South. Ariz. to cent. Mexico.  
*Cerceris orestes* Banks, 1947. *Psyche* 54: 13. ♀, ♂.
- completa** Banks. Calif. and south. Oreg.  
*Cerceris completa* Banks, 1919. *Canad. Ent.* 51: 83. ♂.  
*Cerceris grandis perena* Scullen, 1965. *U. S. Natl. Mus., Proc.* 116: 415, fig. 38. ♀.
- conifrons** Mickel. Alta., Nebr., Wyo., Utah, Nev., Calif. south to Ariz. and Tex.; Mexico (south to Zacatecas at higher elevations).  
*Cerceris conifrons* Mickel, 1916. *Amer. Ent. Soc., Trans.* 42: 410. ♀.
- convergens** Viereck and Cockerell. B. C., Wash., Mont. and S. Dak. south to Calif. and Tex.; Mexico south to Morelos, Veracruz and Baja California.  
*Cerceris convergens* Viereck and Cockerell, 1904. *N. Y. Ent. Soc., Jour.* 12: 136. ♀.  
*Cerceris rinconis* Viereck and Cockerell, 1904. *N. Y. Ent. Soc., Jour.* 12: 137. ♀.  
*Cerceris hesperia* Banks, 1917. *Mus. Compar. Zool., Bul.* 61: 115. ♀, ♂.  
*Cerceris pudorosa* Mickel, 1918 (1917). *Nebr. Univ. Studies* 17: 338. ♀, ♂.  
*Cerceris snowi* Banks, 1919. *Canad. Ent.* 51: 84. ♂.
- crandalli** Scullen. South. Ariz. to west. Tex.; Mexico (Baja California, Sinaloa, Chihuahua).  
*Cerceris crandalli* Scullen, 1965. *U. S. Natl. Mus., Proc.* 116: 372, figs. 13, 116a, b, c. ♀, ♂.
- Taxonomy: Scullen, 1968. *Ent. News* 79: 158, figs. 7, 8. ♂.
- crotonella** Viereck and Cockerell. N. Dak., Idaho and north. Calif. south to Ariz. and Tex.; Mexico (Chihuahua, Sonora). Prey: *Carpophilus pallipennis* (Say).  
*Cerceris crotonella* Viereck and Cockerell, 1904. *N. Y. Ent. Soc., Jour.* 12: 139. ♀.
- Biology: Evans, 1971. *Kans. Ent. Soc., Jour.* 44: 510-511 (prey).
- dentifrons** Cresson. Maine to N. C., Ont., Mich., Wis., Minn., Iowa, S. Dak.  
*Cerceris dentifrons* Cresson, 1865. *Ent. Soc. Phila., Proc.* 5: 124. ♀.
- deserta** Say. Northeast. and centr. States and Provinces, N. B. and Maine west to Alta. and Mont. south to N. C. and Colo. Prey: *Conotrachelus posticatus* Boh.  
*Cerceris deserta* Say, 1824. *In* Keating, *Narr. Long's 2nd Exped.*, v. 2, app., p. 343. ♂.  
*Cerceris fulvipes* Cresson, 1865. *Ent. Soc. Phila., Proc.* 5: 126. ♀. Preocc.  
*Cerceris fulvipediculata* Schletterer, 1887. *Zool. Jahrb., Ztschr. f. System.* 2: 492. ♀. N. name.
- Biology: Peckham and Peckham, 1898. *Wis. Geol. Nat. Hist. Survey, Bul.* 2: 115-116 (nest, prey transport).
- dilatata chisosensis** Scullen. South. Ariz., southwest. Tex.; Mexico (Chihuahua, Coahuila, Durango, Zacatecas).  
*Cerceris dilatata chisosensis* Scullen, 1965. *U. S. Natl. Mus., Proc.* 116: 409, fig. 35. ♀, ♂.
- dilatata dilatata** Spinola. Ariz. to Argentina.  
*Cerceris dilatata* Spinola, 1841. *Soc. Ent. France, Ann.* 10: 118. ♂.  
*Cerceris maximiliani* Saussure, 1867. *Reise d. Novara, Zool.*, v. 2, *Hym.*, p. 94. ♀.  
*Cerceris contracta* Taschenberg, 1875. *Ztschr. Gesam. Naturw.* 45: 396. ♀.  
*Cerceris Caridei* Holmberg, 1903. *Mus. Nac. Buenos Aires, An.* 9 (3): 478. ♀.  
*Cerceris Vigillii* Brethes, 1910. *Mus. Nac. Buenos Aires, An.* 20 (3): 270. ♀.  
*Cerceris divisa* Brethes, 1910. *Mus. Nac. Buenos Aires, An.* 20 (3): 270. ♂.  
*Cerceris olynponis* Strand, 1910. *Zool. Jahrb.* 29: 140. ♀.  
*Cerceris semiatra* Banks, 1947. *Psyche* 54: 25. ♂.



**echo atrata** Scullen. Maine, Mass., N. Y., N. J., Va., N. C., Ga., Wis., Ill., Kans. Ecology: Makes multicellular nest in flat, fine-grained sand, stores up to 30 prey per cell. Prey: *Olibrus neglectus* Casey, *O. sp.*, *Phalacrus* sp.

*Cerceris echo atrata* Scullen, 1965. U. S. Natl. Mus., Proc. 116: 377, fig. 16. ♀.

Biology: Evans, 1971. Kans. Ent. Soc., Jour. 44: 509, figs. 6-7 (nest, prey).

**echo** Mickel. Iowa, N. Dak. to Tex., west to Idaho, north. Calif. and Ariz.; Mexico (Chihuahua, Coahuila, Durango, Zacatecas, Aguascalientes). Ecology: Nests in open sand. Prey: *Phalacrus* sp.

*Cerceris echo* Mickel, 1916. Amer. Ent. Soc., Trans. 42: 412. ♀.

Biology: Evans, 1971. Kans. Ent. Soc., Jour. 44: 509-510 (nest, prey).

**femurrubrum** Viereck and Cockerell. Colo. and west. Tex. to south. Calif.; Mexico (Baja California and Coahuila south to Puebla). Ecology: Nests in moist sand. Prey:

*Eurymetopon rufipes* Esch., *Steriphanus* sp.

*Cerceris femur-rubrum* Viereck and Cockerell, 1904. N. Y. Ent. Soc., Jour. 12: 135. ♂.

*Cerceris thione* Banks, 1947. Psyche 54: 18. ♂.

*Cerceris athene* Banks, 1947. Psyche 54: 20. ♀.

*Cerceris femurrubra rossi* Scullen, 1972. Smithsn. Contrib. Zool. 110: 56, fig. 50. ♀, ♂.

Biology: Wasbauer, 1957. Pan-Pacific Ent. 33: 131 (prey transport). —Alcock, 1974. Jour. Nat. Hist. 8: 650-651 (nest, prey).

**finitima** Cresson. Sask., transcont. in U. S., N. Y. to Fla. west to N. Dak., Wyo., Utah and Calif. south to Guatemala. Parasite: *Dasyneutilla scaveola* (Bl.)? Prey: *Chaetocnema pulicaria* Melsh.

*Cerceris finitima* Cresson, 1865. Ent. Soc. Phila., Proc. 5: 122. ♀.

*Cerceris finitima* var. *nigroris* Banks, 1912. Ent. Soc. Amer., Ann. 5: 27. ♂.

*Cerceris* (*Apiratrix*!) *vierecki* Banks, 1947. Psyche 54: 30. ♀.

*Cerceris finitima citrina* Scullen, 1965. U. S. Natl. Mus., Proc. 116: 380, fig. 18. ♀, ♂.

*Cerceris finitima morelos* Scullen, 1972. Smithsn. Contrib. Zool. 110: 25, fig. 13. ♀, ♂.

Biology: Strandtmann, 1945. Ent. Soc. Amer., Ann. 38: 312, fig. 10 (nest, prey).

**flavofasciata flavofasciata** Smith. N. J. to N. C., Ill., Minn. and S. Dak. to Okla. Ecology: Nests in vertical sand banks. Parasite: *Dasyneutilla nigripes* (F.). Prey: *Chlamisus* sp. probably *plicata* (F.), *Cryptocephalus mutabilis* Melsh., *C. notatus* F., *C. fulvipennis* Hald., *C. guttulatus* Oliv., *C. sp.* probably *quadrinaculatus* Say, *Bassaricus clathratus* Melsh., *B. sp.* probably *sellatus* Suffr.

*Cerceris flavofasciata* Smith, 1908. Nebr. Univ. Studies 8: 364. ♀.

*Cerceris natalensis* Brimley, 1927. Ent. News 38: 238. ♀.

Biology: Krombein, 1959. Ent. Soc. Wash., Proc. 61: 197-198 (nest, prey, cocoon, parasite).

—Scullen, 1965. U. S. Natl. Mus., Proc. 116: 422 (prey).

**flavofasciata floridensis** Banks. N. C. to Fla., Ala. Ecology: Nests in vertical face of sand pit, makes more than 2 cells per nest, stores 9-11 prey per cell. Prey: *Cryptocephalus bivius* Newm., *C. binominis* Newm., *C. guttulatus* Suffr., *Chlamisus* sp. probably *nodulosa* Blatch., *Coscinoptera dominicana* (F.).

*Cerceris floridensis* Banks, 1915. Canad. Ent. 47: 403. ♂.

Taxonomy: Evans, 1964. Amer. Ent. Soc., Trans. 90: 276, figs. 68-70 (larva).

Biology: Krombein, 1964. Amer. Mus. Novitates 2201: 20-22 (nest, prey, life cycle).

**frontata** Say. Ill. and Iowa west to Calif., south to Tex. and Ariz.; Mexico (Baja California, Chihuahua, Coahuila, Durango). Ecology: Nests in flat, hard-packed sometimes stony soil, makes 3 or more cells per nest, stores 6 prey per cell. Parasite: *Parametopia* sp.?, *Exoprosopa fasciata* Macq.; *Hedychrum violaceum* Br.? Prey: *Cleonus pulvereus* (LeC.), *Eupagoderes* sp., *Lixus concavus* Say, *L. mucidus* LeC., *Thecesternus humeralis* (Say).

*Cerceris frontata* Say, 1823. West. Quart. Rptr. 2: 80. ♀.

*Cerceris Texensis* Saussure, 1867. Reise d. Novara, Zool., v. 2, Hym., p. 89. ♀.

*Cerceris occidentalis* Saussure, 1867. Reise d. Novara, Zool., v. 2, Hym., p. 100. ♀.

*Cerceris rauli* Rohwer, 1920. U. S. Natl. Mus., Proc. 57: 230. ♀, ♂.

Taxonomy: Evans, 1964. Amer. Ent. Soc., Trans. 90: 277-278 (larva).

Biology: Rau, 1928. Acad. Sci. St. Louis, Trans. 25: 325-337, figs. 30-34 (nest, prey, parasites ?). —Krombein, 1960. Brooklyn Ent. Soc., Bul. 55: 76-77 (nest, prey). —Scullen, 1965. U. S. Natl. Mus., Proc. 116: 482, pl. 1 (prey, mating).

**fumipennis** Say. U. S. east of Rocky Mts., Wyo., Minn., Mich. and N. H. south to N. Mex. and Fla. Ecology: Nests in hard-packed sand. Parasite: *Vidia* (*Crabrovidia*) sp.; *Phrosinella fumosa* Allen, *Senotainia trilineata* (Wulp)? Prey: *Acmaeodera pulchella* (Herbst), *Actenodes acornis* (Say), *Agrilus abjectus* Horn, *A. anxius* Gory, *A. a. arcuatus* (Say), *A. a. fulgens* LeC., *A. a. torquatus* LeC., *A. b. bilineatus* (Weber), *A. b. carpini* Knull, *A. obsoletoquattus* Gory, *A. politus* Say, *A. ruficollis* (F.), *A. spp.*, *Brachus oreatus* Weber, *Buprestis consularis* Gory, *B. fasciata* F., *B. intricata* Casey, *B. lineata* F., *B. maculipennis* Gory, *B. rufipes* (Oliv.), *B. striata* F., *Chrysobothris adelpha* Germ., *C. azurea* LeC., *C. blanchardi* Horn, *C. breviloba* Fall, *C. dentipes* (Germ.), *C. femorata* (Oliv.), *C. floricola* Gory, *C. monticola* Fall, *C. purpureovittata* Horn, *C. sexsignata* (Say), *C. trinervia* (Kby.), *C. verdigrispennis* Frost, *Cinyra gracilipes* (Melsh.), *Dicerca americana* (Hbst.), *D. caudata* LeC., *D. divaricata* (Say), *D. lurida* (F.), *D. obscura* (F.), *D. punctulata* (Schon.), *D. spreta* (Gory), *D. tuberculata* (Cast.), *Eupristocerus cogitans* (Weber), *Melanophila fulvoguttata* (Harr.), *Poecilnotus cyanipes* (Say); *Chlamisus* sp.; *Conotrachelus* sp.

*Cerceris fumipennis* Say, 1837. Boston Jour. Nat. Hist. 1: 381. ♂.

*Cerceris cincta* Dahlbom, 1844. Hym. Europaea, v. 1, p. 204. ♂.

*Cerceris uncinata* Taschenberg, 1875. Ztschr. Gesam. Naturw. Berlin 11: 397. ♀.

Taxonomy: Evans, 1957. Amer. Ent. Soc., Trans. 83: 84, figs. 21-26 (larva).

Biology: Peckham and Peckham, 1900. Wis. Nat. Hist. Soc., Bul. 1: 90 (nest, prey transport). —Hartman, 1905. Tex. Univ. Bul. 65: 66 (prey). —Grossbeck, 1912. N. Y. Ent. Soc., Jour. 20: 135, 299. —Cartwright, 1931. Ent. News 42: 269 (nest, prey). —Krombein, 1958. Ent. Soc. Wash., Proc. 60: 110 (nest, prey). —Scullen, 1965. U. S. Natl. Mus., Proc. 116: 412-413 (prey). —Evans, 1971. Kans. Ent. Soc., Jour. 44: 501-508, figs. 1-5 (mating, nest, prey, cocoon, parasites).

Morphology: Snodgrass, 1941. Smithsn. Inst., Misc. Collect. 99 (14): pl. 21, figs. A-E (male genitalia).

**gandarai** Rohwer. Tex. (Brooks Co.); Mexico (Coahuila and Sinaloa south to Puebla and Veracruz).

*Cerceris gandarai* Rohwer, 1912. U. S. Natl. Mus., Proc. 41: 470, fig. 9. ♂.

*Cerceris gandarai* (!) Scullen, 1972. Smithsn. Contrib. Zool. 110: 82. ♀, ♂.

**grandis** Banks. South. Calif. and Ariz.; Mexico (Baja California, Sonora).

*Cerceris grandis* Banks, 1913. Amer. Mus. Nat. Hist., Bul. 32: 423. ♀.

**graphica** Smith. Ill., Nebr. to Tex. west to Utah, south. Calif. and south to northwest. South

America. Ecology: Makes vertical burrow and multicellular nest in soil ranging from heavy to wind-blown sand, stores 3-10 prey per cell. Parasite: *Senotainia trilineata* (Wulp) complex?; *Nysson* sp.? Prey: *Eleodes opaca* (Say), *Metapoloba pruinosa* (Horn), *Tenebrionidae* sp.

*Cerceris grafica* Smith, 1873. Ann. and Mag. Nat. Hist. (4) 12: 410. ♀.

*Cerceris hebes* Cameron, 1890. Biol. Cent.-Amer., Hym., v. 2, p. 124, pl. 8, fig. 4. ♂.

*Cerceris macrosticta* Viereck and Cockerell, 1904. N. Y. Ent. Soc., Jour. 12: 133. ♂.

*Cerceris ampla* Banks, 1912. Ent. Soc. Amer., Ann. 5: 16. ♀, ♂.

Biology: Scullen, 1965. U. S. Natl. Mus., Proc. 116: 440 (prey). —Lin, 1967. Ent. Soc. Wash., Proc. 69: 312-317, 3 figs. (nest, prey transport). —Alcock, 1974. Jour. Nat. Hist. 8: 645-650, 7 figs. (nest, prey transport, parasites ?). —Alcock and Gamboa, 1975 (1974). Psyche 81: 528-533, 2 figs. (home ranges of males).

**halone** Banks. Man., N. Dak. east to N. H. south to Tex., Ark. and S. C. Parasite: *Hedychrum confusum* Buyss. Prey: *Curculio confusor* Ham., *C. nasicus* (Say), *C. proboscideus* F., *C. rectus* Say, *C. sulcatulus* (Casey).

*Cerceris halone* Banks, 1912. Ent. Soc. Amer., Ann. 5: 24. ♀.

*Cerceris architis* Mickel, 1916. Amer. Ent. Soc., Trans. 42: 409. ♀.

*Cerceris alacris* Mickel, 1918 (1917). Nebr. Univ. Studies 17: 334. ♀.

*Cerceris salome* Banks, 1923. Canad. Ent. 55: 21. ♀.

- Cerceris shermani* Brimley, 1928. Elisha Mitchell Sci. Soc., Jour. 43: 200. ♀.
- Biology: Abbott, 1928. Ent. News 39: 205-206 (nesting habits). — Krombein, 1958. U. S. Dept. Agr., Monog. 2, Sup. 1, p. 197 (prey). — Byers, 1962. Kans. Ent. Soc., Jour. 35: 317-321 (nest, prey carriage, parasite (misdet. as *H. violaceum* Br.)). — Scullen, 1965. U. S. Natl. Mus., Proc. 116: 484 (prey). — Evans, 1971. Kans. Ent. Soc., Jour. 44: 511-512, fig. 9 (nest, prey).
- hurdi** Scullen. Ariz. (Patagonia) south through Mexico to Nicaragua.  
*Cerceris hurdi* Scullen, 1972. Smithsn. Contrib. Zool. 110: 48, figs. 40, 128. ♀, ♂.
- insolita albida** Scullen. Ariz., N. Mex., west. Tex.; Mexico (Veracruz).  
*Cerceris insolita albida* Scullen, 1965. U. S. Natl. Mus., Proc. 116: 447, fig. 59. ♀, ♂.
- insolita atrafemori** Scullen. Ariz.; Mexico (Sinaloa, Nayarit).  
*Cerceris insolita atrafemori* Scullen, 1965. U. S. Natl. Mus., Proc. 116: 448, figs. 6, 143a, b, ♀.
- insolita insolita** Cresson. N. J. to S. Dak. south to Fla. and Ariz.; Mexico (Chihuahua, Jalisco).  
 Ecology: Nests in flat, coarse-grained sand. Prey: *Rhabdopterus praetextus* (Say).  
*Cerceris insolita* Cresson, 1865. Ent. Soc. Phila., Proc. 5: 129. ♂.  
*Cerceris intracitibilis* Mickel, 1916. Amer. Ent. Soc., Trans. 42: 411. ♀.
- Biology: Krombein, 1964. Brooklyn Ent. Soc., Bul. 58: 119 (nest, prey).
- irene** Banks. Minn., Wyo., Colo., Kans., Okla., Tex., La.; Mexico (Tamaulipas).  
*Cerceris irene* Banks, 1912. Ent. Soc. Amer., Ann. 5: 26. ♀.
- kennicottii kennicottii** Cresson. Md. to Fla. west to S. Dak., Colo., Tex.; Mexico (Jalisco, Morelos, Veracruz).  
*Cerceris kennicottii* Cresson, 1865. Ent. Soc. Phila., Proc. 5: 128. ♂.  
*Cerceris eriogoni* Viereck and Cockerell, 1904. N. Y. Ent. Soc., Jour. 12: 139. ♂.
- kennicottii zapoteca** Saussure. South. Ariz. to west. Tex. south to Panama.  
*Cerceris Zapoteca* Saussure, 1867. Reise d. novara, Zool., v. 2, Hym., p. 89. ♂.  
*Cerceris montivaga* Cameron, 1890. Biol. Cent.-Amer., Hym., v. 2, p. 119, pl. 7, fig. 16. ♀.  
*Cerceris kennicottii beali* Scullen, 1965. U. S. Natl. Mus., Proc. 116: 386, fig. 22. ♀, ♂.
- krombeini** Scullen. South. Ariz.  
*Cerceris krombeini* Scullen, 1965. U. S. Natl. Mus., Proc. 116: 388, figs. 23, 122a, b, c. ♀, ♂.
- macswaini** Scullen. South. Calif. and Ariz.  
*Cerceris macswaini* Scullen, 1965. U. S. Natl. Mus., Proc. 116: 485, figs. 84, 164a, b, c. ♀, ♂.
- mandibularis** Patton. N. Y. to Ga., W. Va. to Iowa south to Tenn. and La.  
*Cerceris mandibularis* Patton, 1881. Boston Soc. Nat. Hist., Proc. 20: 403. ♀, ♂.
- melanthe** Banks. Que. to N. C. west to Ill., southwest to south. Ariz.  
*Cerceris melanthe* Banks, 1947. Psyche 54: 21. ♀.  
*Cerceris nitida* Banks, 1913. Amer. Mus. Nat. Hist., Bul. 32: 424. ♀, ♂. Preocc.
- mimica** Cresson. Fla. to Ariz., Kans.; Mexico (Nuevo Leon and Chihuahua south to Oaxaca).  
*Cerceris mimica* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 228. ♀, ♂.  
*Cerceris esau* Schletterer, 1887. Zool. Jahrb., Ztschr. f. System. 2: 458. ♀.  
*Cerceris minima*(!) Schletterer, 1887. Zool. Jahrb., Ztschr. f. System. 2: 497.  
*Cerceris englehardti* Banks, 1947. Psyche 54: 12. ♂.
- minax** Mickel. West. U. S.  
*Cerceris minax* Mickel, 1918 (1917). Nebr. Univ. Studies 17: 339. ♀, ♂.
- morata** Cresson. Nebr. to Tex. west to Utah and Ariz., south in Mexico to Oaxaca. Ecology:  
 Makes multicellular nest in heavy soil, stores 59-67 prey per cell. Prey: *Rhyssomatus parvulus* Casey, Tachiinae probably *Sibinia* sp.  
*Cerceris morata* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 230. ♀.  
*Cerceris nasica* Viereck and Cockerell, 1904. N. Y. Ent. Soc., Jour. 12: 132. ♀.
- Biology: Alcock, 1974. Jour. Nat. Hist. 8: 651 (nest, prey).
- neahminax** Scullen. N. Mex., Ariz., Utah.  
*Cerceris neahminax* Scullen, 1965. U. S. Natl. Mus., Proc. 116: 390, figs. 24, 123a, b, c. ♀.
- nebrascensis** Smith. S. Dak., Nebr., Wyo., Colo.  
*Cerceris nebrascensis* Smith, 1908. Nebr. Univ. Studies 8: 368. ♀.

- nigrescens** Smith. Que. to B. C. south to N. C., Tex. and Calif. Ecology: Nests in small aggregations in hard-packed, stony or sandy loam, stores up to 25 prey per cell. Parasite: *Senotainia trilineata* (Wulp)? Prey: *Calomycterus setarius* Roelofs, *Sitona scissifrons* (Say), *S. hispidula* (F.), *Hyperodes delumbis* Gyll., *Gymnetron antirrhini* Payk., *G. sp.*
- Cerceris nigrescens* Smith, 1856. Cat. Hym. Brit. Mus. 4: 466. ♀.
- Cerceris arelate* Banks, 1912. Ent. Soc. Amer., Ann. 5: 18. ♀.
- Cerceris nigrilulus* Banks, 1915. Canad. Ent. 47: 402. ♂.
- Cerceris munda* Mickel, 1918 (1917). Nebr. Univ. Studies 17: 337. ♀, ♂.
- Cerceris abbreviata* Banks, 1919. Canad. Ent. 51: 84. ♂.
- Cerceris crawfordi* Brimley, 1928. Elisha Mitchell Sci. Soc., Jour. 43: 199. ♂.
- Biology: Peckham and Peckham, 1898. Wis. Geol. Nat. Hist. Surv., Bul. 2: 116-117 (nest, prey). — Krombein, 1936. Ent. News 47: 94-95 (nest, prey, parasite ?). — Krombein, 1938. Ent. News 49: 1-3 (nest, prey). — Evans, 1971. Kans. Ent. Soc., Jour. 44: 512 (nest, prey).
- occipitomaculata** Packard. Minn. and S. Dak. to Tex., Colo., Ariz.; Mexico (Chihuahua).
- Cerceris occipitomaculata* Packard, 1866. Ent. Soc. Phila., Proc. 6: 62. ♂.
- Cerceris fasciola* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 230. ♂.
- Cerceris novomexicana* Viereck and Cockerell, 1904. N. Y. Ent. Soc., Jour. 12: 137. ♀.
- parkeri** Scullen. South. Tex. and Ariz., south in Mexico to Chiapas.
- Cerceris parkeri* Scullen, 1972. Smithsn. Contrib. Zool. 110: 35, figs. 22, 112. ♀, ♂.
- poculum** Scullen. South. Ariz., west. Tex.
- Cerceris poculum* Scullen, 1965. U. S. Natl. Mus., Proc. 116: 391, figs. 25, 124a, b, c. ♀.
- posticata** Banks. N. Mex. (Jemez Mts.).
- Cerceris posticata* Banks, 1916. Ent. News 27: 64. ♂.
- rhois** Rohwer. N. Mex. (White Mts.).
- Cerceris rhois* Rohwer, 1908. Canad. Ent. 40: 325. ♂.
- robertsonii bifida** Scullen. Va., N. C., Ga., Ind.
- Cerceris robertsonii bifidus* Scullen, 1965. U. S. Natl. Mus., Proc. 116: 428, figs. 45, 137a, b, c. ♀.
- robertsonii emmitosa** Scullen. Fla., Ga. Ecology: Nests in slightly sloping, sparsely vegetated sand, makes more than 6 cells per nest, stores 6-14 prey per cell. Prey: *Colaspis farsosa* Say, *Paria* sp.
- Cerceris robertsonii emmitosus* Scullen, 1964. Ent. News 75: 144. ♀.
- Taxonomy: Evans, 1964. Amer. Ent. Soc., Trans. 90: 277 (larva).
- Biology: Krombein, 1964. Amer. Mus. Novitates 2201: 22-23 (nest, prey).
- robertsonii miltosa** Scullen. Fla.
- Cerceris robertsonii miltosus* Scullen, 1965. U. S. Natl. Mus., Proc. 116: 429, fig. 47. ♀.
- robertsonii robertsonii** Fox. Que., Ont. to N. C. west to S. Dak. and Kans., Tex. Ecology: Nests in small aggregations in fine, firm sand to coarse sandy gravel, stores 8-12 prey per cell. Parasite: *Metopia argyrocephala* (Meig.), *Miltogrammini* sp. Prey: *Cryptocephalus notatus* F., *Pachybrachis dilatatus* Suffr., *Rhabdopterus picipes* (Oliv.), *Tynnus tricolor* F.
- Cerceris robertsonii* Fox, 1893. N. Y. Ent. Soc., Jour. 1: 55. ♀, ♂.
- Cerceris austrina* Fox, 1893. Psyche 6: 556. ♀, ♂.
- Cerceris pleuralis* Smith, 1908. Nebr. Univ. Studies 8: 366. ♂, ♀.
- Taxonomy: Evans, 1957. Amer. Ent. Soc., Trans. 83: 86, figs. 27-30 (larva; described both as *nigrescens* Sm. and *robertsonii*). — Evans, 1959. Amer. Ent. Soc., Trans. 85: 156-157 (larva).
- Biology: Krombein, 1953 (1952). Wasmann Jour. Biol. 10: 288-294 (nest, prey, egg, life cycle, parasite). — Krombein, 1953. Ent. Soc. Wash., Proc. 55: 119-121 (nest, prey). — Evans, 1959. Amer. Ent. Soc., Trans. 85: 157 (prey). — Evans, 1971. Kans. Ent. Soc., Jour. 44: 511, fig. 8 (nest, prey).
- rozeni** Scullen. Fla. (Highlands Co.).
- Cerceris rozeni* Scullen, 1971. N. Y. Ent. Soc., Jour. 79: 130, 4 figs. ♀, ♂.

**rubrata** Bohart and Menke. Fla.*Cerceris rufa* Scullen, 1965. U. S. Natl. Mus., Proc. 116: 449, fig. 61. ♀, ♂. Preocc.*Cerceris rubrata* Bohart and Menke, 1976. Sphecids wasps of world, p. 586. N. name.**rufinoda** Cresson. Md., Va., N. C., Ohio, N. Dak. to Tex. west to B. C., Calif.; Mexico (Durango, San Luis Potosi). Prey: *Miccotrogus picrostris* (F.), *Smicromyrax squalidus* Casey.*Cerceris rufinoda* Cresson, 1865. Ent. Soc. Phila., Proc. 5: 121. ♂.*Cerceris rufinoda* var. *crucis* Viereck and Cockerell, 1904. N. Y. Ent. Soc., Jour. 12: 139. ♀.

Biology: Strandtmann, 1945. Ent. Soc. Amer., Ann. 38: 311, fig. 9 (nest, prey). —Scullen, 1951. U. S. Dept. Agr., Monog. 2: 1010 (prey).

**rufopicta** Smith. Fla. to N. C.*Cerceris rufo-picta* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 467. ♂.**sandiegensis** Scullen. South. Calif. to southwest. N. Mex.*Cerceris sandiegensis* Scullen, 1965. U. S. Natl. Mus., Proc. 116: 432, fig. 49. ♀, ♂.**serripes** (Fabricius). North America.*Vespa serripes* Fabricius, 1781. Spec. Ins., v. 1, p. 46. ♀.

Taxonomy: Scullen, 1965. U. S. Natl. Mus., Proc. 116: 503 (notes on type).

**sexta** Say. Nebr., Wyo. and Utah south to N. Mex. and Ariz.*Cerceris sexta* Say, 1837. Boston Jour. Nat. Hist. 1: 382. ♂.*Cerceris biungulata* Cresson, 1865. Ent. Soc. Phila., Proc. 5: 118. ♀.*Cerceris orphne* Banks, 1947. Psyche 54: 15. ♂.**sextoides** Banks. B. C. to south. Calif., Idaho, Utah. Prey: *Sitona californica* Fahr.,*Trigonoscuta pilosa* Motsch.*Cerceris sextoides* Banks, 1947. Psyche 54: 10. ♀, ♂.*Cerceris eury mele* Banks, 1947. Psyche 54: 11. ♀, ♂.Taxonomy: Scullen, 1969. Ent. News 80: 283-284 (separation of *sextoides* and *tapaneca* Sauss.).

Biology: Scullen, 1965. U. S. Natl. Mus., Proc. 116: 510 (prey).

**squamulifera** Mickel. N. C., Ark., Nebr. to Tex.*Cerceris squamulifera* Mickel, 1916. Amer. Ent. Soc., Trans. 42: 411. ♀.

Taxonomy: Scullen, 1968. Ent. News 79: 154-156, 4 figs. ♂.

**stigmatosalis** Banks. Alta., B. C., Minn. to Mont. south to Tex.; Mexico (Sonora, Durango, San Luis Potosi, Mexico).*Cerceris stigmatosalis* Banks, 1916. Ent. News 27: 64. ♂.*Cerceris fugatrix* Mickel, 1918 (1917). Nebr. Univ. Studies 17: 335. ♂.*Cerceris sayi* Banks, 1923. Canad. Ent. 55: 21. ♀, ♂.*Cerceris stevensi* Banks, 1923. Canad. Ent. 55: 22. ♀.**texana** Scullen. Tex.*Cerceris texana* Scullen, 1965. U. S. Natl. Mus., Proc. 116: 511, figs. 97, 177a, b, c. ♀.**tolteca** Saussure. Ga., Fla., La., Okla., Ark., Tex., Ariz.; Mexico, Honduras.*Cerceris Tolteca* Saussure, 1867. Reise d. Novara, Zool., v. 2, Hym., p. 94. ♀, ♂.*Cerceris cosmiocephala* Cameron, 1904. Invertebrata Pacifica 1: 67. ♂.**townsendi** Viereck and Cockerell. N. Mex. (Las Cruces).*Cerceris townsendi* Viereck and Cockerell, 1904. N. Y. Ent. Soc., Jour. 12: 140. ♀.**truncata** Cameron. South. Tex., N. Mex., Ariz., south to Costa Rica. Ecology: Nests in large aggregation in hard-packed soil, stores up to 10 prey per cell. Prey: *Algarobius prosopis* (LeC.), *Mimosestes protractus* (Horn), *M. amicus* (Horn), *Neltumius arizonensis* (Schffr.).*Cerceris truncata* Cameron, 1890. Biol. Cent.-Amer., Hym., v. 2, p. 121, pl. 7, figs. 19, 20. ♀, ♂.

Biology: Werner, 1960. Psyche 67: 43-44 (nest, male activity, prey).

**vanduzeei** Banks. B. C. to Calif., Idaho, Utah.*Cerceris vanduzeei* Banks, 1917. Mus. Compar. Zool., Bul. 61: 114. ♀.*Cerceris complanata* Mickel, 1918 (1917). Nebr. Univ. Studies 17: 340. ♂, ♀.*Cerceris vanduzeei eburnea* Scullen, 1965. U. S. Natl. Mus., Proc. 116: 399, fig. 30. ♀.

**varians** Mickel. Calif., Nev.; Mexico (Michoacan).

*Cerceris varians* Mickel, 1918 (1917). Nebr. Univ. Studies 17: 336. ♀, ♂.

**veracruz veracruz** Scullen. Tex. south in Mexico to Campeche. Another subsp. occurs in El Salvador.

*Cerceris veracruz veracruz* Scullen, 1972. Smithsn. Contrib. Zool. 110: 53, figs. 45, 132a-d. ♀, ♂.

**verticalis** Smith. N. C. to Fla. west to Kans. and Tex.; Mexico (Coahuila, Nuevo Leon, Tamaulipas).

*Cerceris verticalis* Smith, 1856. Cat. Hym. Brit. Mus., v. 4, p. 466. ♀.

*Cerceris gnara* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 229. ♂.

*Cerceris firma* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 229. ♀.

**vicina** Cresson. Nebr., Wyo., Colo., Kans., Tex.

*Cerceris vicina* Cresson, 1865. Ent. Soc. Phila., Proc. 5: 120. ♀.

*Cerceris platyrhina* Viereck and Cockerell, 1904. N. Y. Ent. Soc., Jour. 12: 133. ♀.

**wyomingensis** Scullen. N. Dak., Wyo.

*Cerceris wyomingensis* Scullen, 1965. U. S. Natl. Mus., Proc. 116: 519, figs. 102, 182a, b, c. ♀.

**zelica** Banks. N. Y., Minn. and S. Dak. to N. C. and Tex.

*Cerceris zelica* Banks, 1912. Ent. Soc. Amer., Ann. 5: 23. ♂, ♀.

### Genus EUCERCERIS Cresson

*Eucerceris* Cresson, 1865. Ent. Soc. Phila., Proc. 5: 104.

Type-species: *Eucerceris fulvipes* Cresson. Desig. by Pate, 1937.

Revision: Scullen, 1939. Oreg. State Monog., Studies in Ent. 1: 1-80, figs. 1-158e. — Scullen, 1968. U. S. Natl. Mus., Bul. 268: 1-97, figs. 1-98h.

Taxonomy: Scullen, 1948. Pan-Pacific Ent. 24: 155-180 (revised key).

**angulata** Rohwer. N. Mex., Ariz.; Mexico (Sonora, Baja California).

*Eucerceris angulata* Rohwer, 1912. Amer. Mus. Nat. Hist., Bul. 31: 326. ♀.

Taxonomy: Scullen, 1939. Oreg. State Monog., Studies in Ent. 1: 57. ♂.

**arenaria** Scullen. Southwest. Tex. to Calif., Nev., Colo.

*Eucerceris arenaria* Scullen, 1948 Pan-Pacific Ent. 24: 168. ♀, ♂.

Biology: Alcock, 1975. Kans. Ent. Soc., Jour. 48: 533-536, figs. 1, 3 (male mating strategy).

**bitruncata** Scullen. Tex., N. Mex., Ariz. Ecology: Nests in flat, stony soil, makes a multicellular nest, stores 39-41 small prey per cell; first progeny may transform to adults before mother completes nest. Prey: *Minyomeres languidus* Horn.

*Eucerceris bitruncata* Scullen, 1939. Oreg. State Monog., Studies in Ent. 1: 35. ♀.

*Eucerceris triciliata* Scullen, 1948. Pan-Pacific Ent. 24: 172. ♂. N. syn. (R. M. Bohart).

Taxonomy: Evans, 1964. Amer. Ent. Soc., Trans. 90: 278-279, figs. 71-73 (larva).

Biology: Krombein, 1960. Brooklyn Ent. Soc., Bul. 55: 77-79 (nest, prey, cocoon).

**canaliculata** (Say). Ark., S. Dak. and Mont. south to Tex. and Ariz., Calif.; Mexico (Baja California and Durango south to Hidalgo).

*Philanthus canaliculatus* Say, 1823. West Quart. Rptr. 2: 79. ♂.

*Cerceris bidentata* Say, 1823. West. Quart. Rptr. 2: 80. ♀. Preocc.

*Cerceris cameroni* Schulz, 1906. Spolia Hym., p. 194. N. name.

*Eucerceris canaliculata* var. *atronitida* Scullen, 1939. Oreg. State Monog., Studies in Ent. 1: 50. ♂, ♀.

*Eucerceris biconica* Scullen, 1948. Pan-Pacific Ent. 24: 178. ♀.

Biology: Alcock, 1975. Kans. Ent. Soc., Jour. 48: 536-538, figs. 2, 4 (male mating strategy).

**conata** Scullen. Nebr., Tex.

*Eucerceris conata* Scullen, 1939. Oreg. State Monog., Studies in Ent. 1: 34. ♀.

*Eucerceris hespera* Scullen, 1948. Pan-Pacific Ent. 24: 171. ♂.

**elegans elegans** Cresson. Nev., Calif.; Mexico (Baja California).

*Eucerceris elegans* Cresson, 1879. Amer. Ent. Soc., Trans. 7: Proc., p. xxiii. ♂. Preocc. in *Cerceris*.

*Cerceris nevadensis* Dalla Torre, 1890. Wien. Ent. Ztg. 9: 200. N. name.

**elegans ferruginosa** Scullen. South. Calif.

*Eucerceris ferruginosa* Scullen, 1939. Oreg. State Monog., Studies in Ent. 1: 45. ♀.

*Eucerceris mojavenensis* Scullen, 1968. U. S. Natl. Mus., Bul. 268: 44, figs. 26, 80a-c. ♂.

**elegans monoensis** Scullen. East. centr. Calif.

*Eucerceris elegans monoensis* Scullen, 1968. U. S. Natl. Mus., Bul. 268: 28, figs. 14, 69a-f. ♀, ♂.

**flavocincta** Cresson. Man. to B. C. south to N. Mex. and Calif. Ecology: Nests in hard stony

soil, provides up to 7 cells per nest, stores 6-7 prey per cell. Parasite: *Hedychrum nigropilosum* Mocs.? Prey: *Dyslobus lecontei* Casey, *D. segnis* (LeC.), *D. sp.*, *Pauscopus aequalis* (Horn), *Peritaxia nigricollis* Horn.

*Eucerceris flavocinctus* Cresson, 1865. Ent. Soc. Phila., Proc. 5: 109. ♀.

*Eucerceris cingulatus* Cresson, 1865. Ent. Soc. Phila., Proc. 5: 110. ♂.

*Eucerceris striareata* Viereck and Cockerell, 1904. N. Y. Ent. Soc., Jour. 12: 85. ♀.

*Eucerceris chapmanae* Viereck and Cockerell, 1904. N. Y. Ent. Soc., Jour. 12: 86. ♂.

Taxonomy: Evans, 1957. Amer. Ent. Soc., Trans. 83: 88, figs. 32-35 (larva).

Biology: Scullen, 1939. Oreg. State Monog., Studies in Ent. 1: 12-14 (nest, prey, cocoon, male behavior). —Bohart and Powell, 1956. Pan-Pacific Ent. 32 143-144 (nest, prey, parasite ?).

—Evans, 1970. Mus. Compar. Zool., Bul. 140: 502 (nest, prey).

**fulvipes** Cresson. Alta., Mont., S. Dak. to Wyo., south to Tex., Ariz. and south. Calif. Ecology:

Nests in hard stony soil, makes more than 5 cells per nest, stores 12-18 prey per cell.

Parasite: *Taxigramma heteroneura* (Meig.)?; *Hedychrum parvum* Aar.? Prey:

*Brachyrhinus ovatus* L., *Ceutorhynchus punctiger* Gyll., *Hyperodes* sp. Predator:

*Philanthus zebratus* Cr.

*Eucerceris fulvipes* Cresson, 1865. Ent. Soc. Phila., Proc. 5: 111. ♀, ♂. Preocc. in *Cerceris*.

*Cerceris cressoni* Schletterer, 1887. Zool. Jahrb., Ztschr. f. System. 2: 489. N. name.

*Eucerceris fulvipes*(?) Ashmead, 1899. Canad. Ent. 31: 295. ♀.

*Eucerceris simulatrix* Viereck and Cockerell, 1904. N. Y. Ent. Soc., Jour. 12: 87. ♂.

Biology: Evans, 1970. Mus. Compar. Zool., Bul. 140: 502 (nest, prey transport, parasites ?).

**insignis** Provancher. Nev., Calif.; Mexico (Baja California).

*Eucerceris insignis* Provancher, 1889. Addit. Corr. Faune Ent. Canada Hym., p. 418. ♂. Preocc. in *Cerceris*.

*Cerceris provancheri* Dalla Torre, 1890. Wien. Ent. Ztg. 9: 204. N. name.

**lacunosa lacunosa** Scullen. South. Ariz. to southwest. Tex.; Mexico (Chihuahua, Durango).

*Eucerceris lacunosa* Scullen, 1939. Oreg. State Monog., Studies in Ent. 1: 19. ♂.

*Eucerceris arizonensis* Scullen, 1939. Oreg. State Monog., Studies in Ent. 1: 20. ♀.

**lacunosa sabinasae** Scullen. South. Ariz.; Mexico (Coahuila).

*Eucerceris lacunosa sabinasae* Scullen, 1968. U. S. Natl. Mus., Bul. 268: 36, fig. 20. ♂, ♀.

**melanovittata** Scullen. South. Ariz., N. Mex., west. Tex.; Mexico (Nuevo Leon).

*Eucerceris melanovittata* Scullen, 1948. Pan-Pacific Ent. 24: 164. ♂.

**mellea** Scullen. Southwest. Tex., N. Mex.; Mexico (Chihuahua).

*Eucerceris mellea* Scullen, 1948. Pan-Pacific Ent. 24: 165. ♀, ♂.

**montana** Cresson. Mont., Utah to Kans., south to Ariz. and west. Tex., south in Mexico to Jalisco and San Luis Potosi.

*Eucerceris montanus* Cresson, 1882. Amer. Ent. Soc., Trans. 10: Proc., p. viii. ♀, ♂.

*Cerceris sonorensis* Cameron, 1891. Biol. Cent.-Amer., Hym., v. 2, p. 129, pl. 8, fig. 10. ♂.

**morula albarenae** Scullen. South. N. Mex., southwest. Tex.

*Eucerceris morula albarenae* Scullen, 1968. U. S. Natl. Mus., Bul. 268: 46, fig. 29. ♀, ♂.

**morula morula** Scullen. South. N. Mex., southwest. Tex.; Mexico (San Luis Potosi, Aguascalientes, Zacatecas, Queretaro, Hidalgo).

*Eucerceris morula morula* Scullen, 1968. U. S. Natl. Mus., Bul. 268: 49, figs. 30, 82a-f. ♀, ♂.

- pimarum** Cockerell and Rohwer. S. Dak. through Colo., Utah, Nev. to Calif. south to west. Tex. and Ariz.; Mexico (Chihuahua, Coahuila, Durango).  
*Eucerceris pimarum* Cockerell and Rohwer, 1908. *In* Rohwer, *Canad. Ent.* 40: 326. ♀.  
*Eucerceris apicata* Banks, 1915. *Canad. Ent.* 47: 404. ♂.
- rubripes** Cresson. Rocky Mts. to east. Nebr. and Kans., north to Canada and south to Tex.  
 Prey: *Peritaxia* sp.  
*Eucerceris rubripes* Cresson, 1879. *Amer. Ent. Soc., Trans.* 7: Proc., p. xxiii. ♂.  
*Eucerceris unicornis* Patton, 1879. U. S. Geol. and Geog. Survey, *Bul.* 5: 359. ♀.  
*Aphilanthops marginipennis* Cameron, 1890. *Biol. Cent.-Amer., Hym.* v. 2, p. 105. ♂.
- Biology: Scullen, 1968. U. S. Natl. Mus., *Bul.* 268: 56 (prey). — Alcock, 1975. *Kans. Ent. Soc., Jour.* 48: 538 (male mating strategy).
- ruficeps** Scullen. Cent. Calif., Nev. Ecology: Nests in hard-packed sand in abandoned burrows of the bee *Sphexodogastra aberrans* (Cwfd.), makes up to 5 or more cells per nest, stores 6-22 prey per cell. Parasite: Miltogrammini spp. Prey: *Dysticheus rotundicollis* Van Dyke, *Sitona californicus* Fahr.  
*Eucerceris ruficeps* Scullen, 1948. *Pan-Pacific Ent.* 24: 175. ♀.
- Biology: Linsley and MacSwain, 1954. *Pan-Pacific Ent.* 30: 11-14 (nest, prey, parasites).
- similis** Cresson. Oreg., Calif., Nev., south. Idaho, west. Wyo., Colo.  
*Eucerceris similis* Cresson, 1879. *Amer. Ent. Soc., Trans.* 7: Proc., p. xxiv. ♀, ♂.  
*Eucerceris barri* Scullen, 1968. U. S. Natl. Mus., *Bul.* 268: 19, figs. 7, 65a-g. ♀, ♂.
- sinuata** Scullen. South centr. Tex.; Mexico (Nuevo Leon, Coahuila).  
*Eucerceris sinuata* Scullen, 1939. *Oreg. State Monog., Studies in Ent.* 1: 47. ♀.
- superba bicolor** Cresson. Alta., Mont., N. Dak., S. Dak., Wyo. Prey: *Ophryastes sulcirostris* (Say), *O. sp.* in *sulcirostris-porosus* complex.  
*Eucerceris bicolor* Cresson, 1881. *Amer. Ent. Soc., Trans.* 9: Proc., p. xxxviii. ♀. Preocc. in *Cerceris*.  
*Cerceris dichroa* Dalla Torre, 1890. *Wien. Ent. Ztg.* 9: 199. ♀. N. name.
- Biology: Scullen, 1939. *Oreg. State Monog., Studies in Ent.* 1: 40 (prey). — Scullen, 1968. U. S. Natl. Mus., *Bul.* 268: 66 (prey).
- superba superba** Cresson. Rocky Mts. east to N. Dak., S. Dak., Nebr., Kans.  
*Eucerceris superbus* Cresson, 1865. *Ent. Soc. Phila., Proc.* 5: 108. ♂.  
*Eucerceris fulvipes* Cresson, 1879. *Amer. Ent. Soc., Trans.* 7: Proc., p. xxiii. ♀.  
*Eucerceris fulvipes* var. *rhodops* Viereck and Cockerell, 1904. *N. Y. Ent. Soc., Jour.* 12: 88. ♀.
- tricolor** Cockerell. Ariz., N. Mex., west Tex.; Mexico (Chihuahua, Coahuila, Hidalgo, Zacatecas).  
*Eucerceris vittatifrons* var. *tricolor* Cockerell, 1897. *Entomologist* 30: 136. ♂.
- Biology: Alcock, 1975. *Kans. Ent. Soc., Jour.* 48: 538 (male mating strategy).
- vittatifrons** Cresson. Wash., Calif., Nev., Utah, Colo., Ariz., N. Mex., Oreg., Idaho.  
*Eucerceris vittatifrons* Cresson, 1879. *Amer. Ent. Soc., Trans.* 7: Proc., p. xxiv. ♂.
- zonata** (Say). New England States, N. Y., Ont. west to N. Dak., north. centr. States west to Wyo. and Colo., Ark., Tex. Ecology: Makes multicellular nest of as many as 9 cells in fine-grained friable sand, stores 3-7 prey per cell. Prey: *Cleonus plumbeus* LeC.  
*Philanthus zonata* Say, 1823. *West. Quart. Rptr.* 2: 80. ♂.  
*Eucerceris laticeps* Cresson, 1865. *Ent. Soc. Phila., Proc.* 5: 107. ♂, ♀.
- Taxonomy: Evans, 1971. *Kans. Ent. Soc., Jour.* 44: 517-518, figs. 15-21 (larva).
- Biology: Evans, 1971. *Kans. Ent. Soc., Jour.* 44: 514-517, figs. 11, 13, 14 (nest, prey, egg, cocoon).



## Superfamily APOIDEA

By PAUL D. HURD, Jr.

This superfamily contains the bees which, like many other aculeates, visit flowers for nectar. However, unlike nearly all other aculeates, the bees and most wasps of the Masaridae provide or feed their larvae with a mixture of pollen and nectar or, in some bees, the mixture is converted into glandular substances which are then fed to their larvae as well as to certain adults. It is presumed by many specialists that bees as a group evolved from flower-visiting wasps, most likely the sphecoid wasps (but possibly also other groups of aculeate wasps), by developing a dependence for food upon pollen and nectar (and sometimes other substances, such as plant oils) and thereby have abandoned the habit of provisioning their nests with insect or spider prey. It is not known when this dependency arose, but it could not have occurred before the advent of Angiosperms which did not begin to flourish until the latter half of the Cretaceous period and which then became the dominant flora of the earth by the Tertiary. In general, the evolution of the entomophilous flower has resulted in the replacement of a shallow, flat or bowl-shaped flower by a corolla-tube. The progressive increase in the depth of the corolla-tube conceivably has resulted from coevolutionary interactions between the flowers and entomophilous insects, especially bees, with progressively more elongated mouthparts. Although the earliest known fossils of bees (Tertiary) are insufficient to establish ancestral relationships with other aculeates or to demonstrate that the evolution of mouthparts proceeded from the short to the long-tongued condition, it is probably significant that this sequence is being corroborated by studies on the systematics, morphology, biology, behavior and biogeography of the contemporary bee fauna of the world. This fauna is at present considered to consist of eight families which in most current classifications are usually arranged phylogenetically as follows: Colletidae, Oxaeidae, Andrenidae, Halictidae, Melittidae, Megachilidae (including the Fidelinae), Anthophoridae and Apidae. Even though there is some and sometimes much variation in the length of the glossa within each of these families, the first five families listed above contain the so-called short-tongued bees while the remaining families consist of the so-called long-tongued bees. Although the short-tongued bees of only three families (Colletidae, Melittidae and Halictidae) are present on all continents, only the Colletidae are exceptionally diverse and well-represented on the southern continents, especially in Australia where other presumably ancient groups of plants and animals survive today. The glossa of the Colletidae, in addition to being normally short and bilobed, is also usually truncate and bifid and therefore is more wasp-like in structure than is the glossa of any other family of bees. Thus it is believed that the initial evolution of bees resulted in the development of short-tongued bees which radiated throughout the earth and this event was subsequently followed by the coevolution of the corolla-tube and the long-tongued bees which also have spread throughout the world. Consequently, the Colletidae are regarded by most specialists as representing the most primitive group of living bees. Most, but not all, authors believe that the Apoidea represent a monophyletic assem-

blage which evolved from a sphecoïd ancestor. Brothers (1975) has concluded that the sphecoïd wasps and bees belong to a single superfamily, the Sphecoidea, which according to him consists of two informal groups, the Sphecoformes (8 families) and the Apoiformes (9 families). However, Lanham (1960) has commented upon the similarities and differences of the Sphecoidea and Apoidea and points out that the presence or absence of the strigil on the hind leg long known to European hymenopterists may be of as much phylogenetic significance as other characters of presumably phylogenetic importance. The value of the strigil in these matters was employed by Boerner (1919) who divides the aculeate Hymenoptera into the Haplocnemata (ants, scolioid wasps, and bees) and the Diplocnemata (sphecoïds, pompilids, and vespids) thereby indicating that bees are more closely related to the scolioids than to the sphecoïd wasps. The phylogeny of the Aculeata deserves a more thorough study and reevaluation before we can dismiss the possibility that the Apoidea is a polyphyletic assemblage having been derived from both scolioid and sphecoïd ancestors.

Most species of bees construct their nests in the ground usually excavating their own tunnels and cells, although many others appropriate preexisting burrows or other cavities in the ground and sometimes modify these to accomplish their needs. Still many others make their nests above ground. Among these are species that gnaw out their nesting tunnels in wood substrates of various kinds including hollow stemmed plants, while others appropriate a wide variety of preexisting cavities, such as abandoned beetle burrows, hollow trees, old mason wasp nests, old bird nests, empty snail shells and old insect galls, while still others make their nests of wax and other materials such as mud, resin, pebbles, pieces of leaves or petals, plant down, etc., and place their nests either in the open attaching them to branches and so forth or place their nests under eaves, bridges, rocks, cow chips and so on. As a consequence of these habits, many species of the families Megachilidae and Apidae readily accept artificial nesting devices (hives, trap-nests, etc.) which not only has made possible detailed studies of their biologies, but also has made possible the manipulation and management of several species, including the common honeybee, for use in the pollination of agricultural crops or for the production of honey and other useful products of value and benefit to mankind.

In nesting behavior the vast majority of bees are solitary including all members of the families Colletidae, Oxaeidae and Melittidae. Except for a few communal species, all members of the family Andrenidae also exhibit solitary nesting behavior. Similarly most species of the family Megachilidae are solitary in habit, although some nest communally (parasocial behavior) while some are quasisocial and possibly a few are even semisocial in their nesting behavior. Among the remaining three families (Halictidae, Anthophoridae and Apidae), the Halictidae and Anthophoridae, each represented by many solitary species, contain some parasocial and eusocial (primitively social) species as well as some subsocial species in the anthophorid tribe Ceratinini. While most species of the family Apidae live in perennial, highly eusocial colonies, others exhibit solitary, parasocial or primitively social nesting behavior.

Bees are exceptionally important pollinators of both native vegetation and many agricultural crops. Unquestionably bee-plant (bee-flower) relationships reflect various strategies on the part of both sets of participants and two of the most commonly recognized behavioral modes of pollen collection by bees are oligolecty and polylecty (see reviews by Grant, 1950; Linsley, 1958; and Baker and Hurd, 1968). The intrafloral relationships of bees not only involves their own survival and evolution, but also through coevolutionary interactions with flowers insures the maintenance and evolution of much of the earth's flora that depends upon entomophilous pollination for reproduction. These interrelationships are of unusual significance to us because we in turn depend upon the earth's flora for our own livelihood and welfare.

In America north of Mexico there are about 3,500 species of bees. This area represents nearly one-sixth of the earth's land surface and, disregarding ecological diversity, this means that the world fauna of bees approximates 21,000 species. Somewhat more than 2,700 of our species are pollen-collecting bees while slightly more than 700 species (or about 21%) are cleptoparasitic species. Only about 800 species of bees occur east of the Mississippi River and thus the apifauna of the larger and more ecologically diverse western portion of America north of Mexico is more than three times richer in species. Since it is well established that the apifaunas of arid regions are consistently much richer in species than any other climatic regions, it is not surprising that most of the North American species of bees are to be found in the southwestern United States and adjacent northern Mexico. All eight recognized families of bees are present in America north of Mexico and are represented by the following numbers of species: Colletidae (153), Ox-

aecidae (4), Andrenidae (1,199), Halictidae (506), Melittidae (30), Megachilidae (607), Anthophoridae (919), and Apidae (47). Among the largest genera in our fauna are: *Andrena* (511), *Perdita* (502), *Nomada* (286), *Dialictus* (189), *Osmia* (133), *Megachile* (114), *Tripeolus* (102), *Melissodes* (99), and *Colletes* (96). In all, our fauna consists of 121 genera of which 92 contain the pollen-collecting species. Several of our species are Holarctic in distribution and eight species, including the European honeybee, are of introduced origin.

The biology of the Apoidea including their behavior, intrafloral ecology, nesting habits, life histories, communication and the like has always fascinated and attracted much interest and study by the laity, the beekeeper and the specialist. An immense literature on these and related subjects has already accumulated and continues to develop so that it is becoming almost an impossibility to accomplish an in-depth bibliography of the Apoidea. For example, there are now more than 100,000 references to the European honeybee alone. Fortunately, the task is made easier by several literature information retrieval systems and especially by the International Bee Research Association, headquartered in England, which publishes the key abstracting journal on bees, *Apicultural Abstracts*, two key research journals in English, *Bee World* and the *Journal of Apicultural Research*, as well as comprehensive bibliographies (*I. B. R. A. Bibliographies*) on selected subjects pertaining to bees.

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## Family COLLETIDAE

This family differs from all other bees in that the females line their cells with a celophane-like substance. The glossa is short, usually truncate or bifid, and this wasp-like feature is the primary basis for considering the Colletidae to be the most primitive family of living bees. Although the Colletidae are found throughout much of the world, the family is especially abundant and diverse in the southern hemisphere being exceptionally well represented in Australia by a large fauna consisting chiefly of the subfamilies Colletinae (Paracolletini), Euryglossinae and Hylaeinae.

In North America the family is represented by four subfamilies of which the nominate tribe of the Colletinae (*Colletes*) and the Hylaeinae (*Hylaeus*) comprise the largest assemblage of the family in America north of Mexico. Only a single species of the Paracolletini (*Eulonchopria punctatissima* Michener) is known to range north of Mexico into the United States (Arizona). The other two subfamilies present in North America are the Xeromelissinae and Diphaglossinae which occur only in the New World and are chiefly centered in the Neotropical Region. Representatives of these subfamilies have been found as far north as southern Mexico (Xeromelissinae) and the southern United States (Diphaglossinae).

While most of the species in America north of Mexico depend upon a comparatively wide variety of flowers for nectar and pollen, the females of a number of species of *Colletes* are either oligoleges or exhibit narrow polylectic tendencies.

### SUBFAMILY COLLETINAE

#### TRIBE PARACOLLETINI

##### Genus EULONCHOPRIA Brethes

*Eulonchopria* Brethes, 1909. *Mus. Nac. Buenos Aires, An.* 19: 247.

Type-species: *Eulonchopria psathyroides* Brethes. Monotypic.

*punctatissima* Michener. Southern Ariz.; Mexico (Guerrero). Pollen: Unknown, but visits flowers of *Acacia* and *Baccharis*.

*Eulonchopria punctatissima* Michener, 1963. *Ent. Soc. Amer., Ann.* 56: 847, fig. 1-2, 7-9. ♀, ♂.

#### TRIBE COLLETINI

##### Genus COLLETES Latreille

*Colletes* Latreille, 1802. *Hist. Nat. Fourmis*, p. 423.

Type-species: *Apis succincta* Linnaeus. Monotypic.

*Evodia* Panzer, 1806. *Krit. Rev. Insektenf. Deutschlands*, v. 2, p. 207.

Type-species: *Apis succincta* Linnaeus. Monotypic. (= *Apis calendarum* Panzer).

*Colletes* subg. *Rhinocolletes* Cockerell, 1910. *Entomologist* 43: 242.



Type-species: *Colletes nasutus* Smith. Monotypic.

*Colletes* subg. *Ptilopoda* Friese, 1921. Stettin. Ent. Ztg. 82: 83.

Type-species: *Colletes spiloptera* Cockerell. Monotypic. (= *Colletes maculipennis* Friese).

*Colletes* subg. *Denticolletes* Noskiewicz, 1936. Prace Nauk. Wydawnictwo Towarzystwa Nauk. Lwowie (2) 3: 486.

Type-species: *Colletes graeffei* Alfken. Monotypic.

*Colletes* subg. *Puncticolletes* Noskiewicz, 1936. Prace Nauk. Wydawnictwo Towarzystwa Nauk. Lwowie (2) 3: 490. Proposed without a type-species designation and therefore invalid under article 13b of International Rules of Zoological Nomenclature.

Several of the subgenera cited in the above synonymy are doubtless valid, but as the sub-generic groupings of *Colletes* have not been properly worked out they are listed as synonyms.

Some species are polytropic, others oligotropic. Several of the principally autumnal species have small vernal broods.

Revision: Stephen, 1954. Kans. Univ. Sci. Bul. 36: 149-527, 87 figs., 8 maps (U. S. spp.).

— Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 24-59, figs. 7-10 (eastern U. S. spp.).

Biology: Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 20-22, figs. 1-3 (*Larrea* visiting spp.).

#### SPECIES GROUP PRODUCTUS

*arizonensis* Stephen. Ariz. mts.

*Colletes arizonensis* Stephen, 1954. Kans. Univ. Sci. Bul. 36: 204. ♂, ♀.

*cercidii* Timberlake. Calif., Ariz. Pollen: Unknown, but visits flowers of *Cercidium torreyanum*.

*Colletes cercidii* Timberlake, 1951. Wasmann Jour. Biol. 9: 198. ♂, ♀.

*gilensis* Cockerell. Colo., Tex., N. Mex., Ariz.; Mexico. Pollen: Unknown, but visits flowers of *Melilotus alba*, *Petalostemon candidus*, *P. flavescens*, *P. oligophyllus*, *Potentilla thurberi*, *Solidago canadensis*.

*Colletes gilensis* Cockerell, 1897. Ann. and Mag. Nat. Hist. (6) 19: 41. ♂.

*perileucus* Cockerell. Calif., Ariz., Tex., Mexico. Pollen: Unknown, but visits flowers of *Melilotus alba*, *Prosopis glandulosa*.

*Colletes perileucus* Cockerell, 1924. Calif. Acad. Sci., Proc. (4) 12: 535. ♀.

*productus* Robertson. Mass., west to Wis., south to Ga. and Ala. Pollen: Unknown, but visits flowers of *Apocynum cannabinum*, *Batodendron*, *Rhus copallina*, *R. glabra*, *Xolisma ligustrina*.

*Colletes producta* Robertson, 1891. Amer. Ent. Soc., Trans. 18: 62. ♂.

*rudis* Timberlake. Calif. (near Indio). Pollen: Unknown, but visits flowers of *Eucelia farinosa*.

*Colletes rudis* Timberlake, 1951. Wasmann Jour. Biol. 9: 197. ♂.

*skinneri* Viereck. Ariz., N. Mex.

*Colletes skinneri* Viereck, 1903. Amer. Ent. Soc., Trans. 29: 58. ♀, ♂.

*vandykei* Timberlake. Ariz. (Santa Rita Mts.).

*Colletes vandykei* Timberlake, 1951. Wasmann Jour. Biol. 9: 200. ♂.

#### SPECIES GROUP COMPACTUS

*compactus compactus* Cresson. N. S. to Ga., west to Wis., Mo., Colo., and Ariz. Parasite: *Epeolus pusillus* Cress., *Epeolus autumnalis* Robt.? Pollen: Compositae, especially flowers of Astereae; Heliantheae; Helenieae.

*Colletes compactus* Cresson, 1868. Boston Soc. Nat. Hist., Proc. 12: 166. ♀, ♂.

Biology: Rau and Rau, 1916. Anim. Behavior, Jour. 6: 367. — Rau, 1922. Acad. Sci. St. Louis, Trans. 24 (7): 37. — Rozen and Favreau, 1968. N. Y. Ent. Soc., Jour. 76: 106-111.

*compactus hesperius* Swenk. B. C., and Idaho south to Calif., Ariz.; Mexico.

*Colletes hesperius* Swenk, 1906. Ent. News 12: 257. ♀, ♂.

## SPECIES GROUP LATITARSIS

- latitarsis** Robertson. Mich. to Fla., west to Mont., Colo., Tex., Ariz. Parasite: *Epeolus bifasciatus* Cresson? Pollen: Unknown, but visits flowers of *Asclepias incarnata*, *A. syriaca*, *Campanula americana*, *Ceanothus americanus*, *Cicuta maculata*, *Lycopus americanus*, *Medicago sativa*, *Melilotus alba*, *Passiflora lutea*, *Physalis lanceolata*, *P. subglabrata*, *P. virginiana*, *Polygonum hydropiperoides*, *Pycnanthemum flexuosum*, *Solidago*, *Symphoricarpos occidentalis*, *Trifolium*.  
*Colletes latitarsis* Robertson, 1891. Amer. Ent. Soc., Trans. 18: 60. ♀, ♂.  
**punctipennis maurus** Stephen. Tex. (Brownsville). The typical *punctipennis* Cresson occurs only in Mexico.  
*Colletes punctipennis maurus* Stephen, 1954. Kans. Univ. Sci. Bul. 36: 232, fig. 11. ♂.

## SPECIES GROUP SIMULANS

- angelicus** Cockerell. Calif. Ecology: Possibly produces two generations annually. Pollen: Unknown, but visits predominantly fall blooming composites including but not restricted to *Baccharis emoryi*, *Gutierrezia sarothrae*, *Haplopappus venetus*, *H. vernonioides*, *Hemizonia paniculata*. Males and females have also been taken at the flowers of an unidentified *Eriogonum*.  
*Colletes angelicus* Cockerell, 1905. South. Calif. Acad. Sci., Bul. 4: 32. ♂.  
**birkmanni** Swenk. Kans., Okla., Tex., N. Mex. Pollen: Unknown, but visits flowers of *Rhus microphylla*.  
*Colletes birkmanni* Swenk, 1906. Ent. News 17: 259. ♀, ♂.  
**bryanti** Timberlake. Ariz., N. Mex.  
*Colletes bryanti* Timberlake, 1951. Wasmann Jour. Biol. 9: 208. ♂, ♀.  
**delodontus** Viereck. N. Mex. Pollen: Unknown, but visits flowers of *Rorripa nasturtium*.  
*Colletes delodontus* Viereck, 1903. Amer. Ent. Soc., Trans. 29: 59. ♀.  
**eulophi** Robertson. South. half of U. S., west to Colo. and Ariz. Parasite: *Epeolus minimus* (Robt.). Pollen: Unknown, but visits flowers of *Aster*, *Ceanothus fendleri*, *C. americanus*, *Chrysanthemum leucanthemum*, *Clematis*, *Eupatorium perfoliatum*, *Melilotus*, *Rubus*, *Solidago nemoralis*, *Sophia obtusa*.  
*Colletes eulophi* Robertson, 1891. Amer. Ent. Soc., Trans. 18: 61. ♀, ♂.  
*Colletes illinoiensis* Robertson, 1891. Amer. Ent. Soc., Trans. 18: 62. ♀.  
**fulgidus fulgidus** Swenk. B. C., Mont., Alta., S. Dak. south to Tex. and Calif. Pollen: Unknown, but visits flowers of *Aster*, *Baccharis emoryi*, *Calochortus luteus*, *Chaenactis sterioides*, *Chrysothamnus*, *Clarkia*, *Coreopsis lanceolata*, *Cryptantha intermedia*, *Encelia farinosa*, *Erigeron*, *Eriogonum fasciculatum*, *E. latifolium nudum*, *Eriophyllum confertifolium*, *Grindelia*, *Gutierrezia californica*, *G. sarothrae*, *Haplopappus arborescens*, *H. parishii*, *H. vernonioides*, *Medicago sativa*, *Melilotus alba*, *Rhus laurina*, *Solidago multiradiata*, *Sphenosciadium capitellatum*.  
*Colletes fulgidus* Swenk, 1904. In Viereck, Canad. Ent. 36: 95. ♀, ♂.  
 Taxonomy: Michener, 1953. Kans. Univ. Sci. Bul. 35: 1018, figs. 27, 30-33, 35 (larva).  
**fulgidus longiplumosus** Stephen. Coastal north. Calif. and San Joaquin Valley. Parasite: *Epeolus* sp. A (Rozen). Pollen: Unknown, but visits flowers of *Armeria californica*, *Clarkia rubicunda*, *Convolvulus*, *Eriophyllum staechadifolium*, *Grindelia latifolia*, *Haplopappus*, *Layia*, *Solidago occidentalis*.  
*Colletes fulgidus longiplumosus* Stephen, 1954. Kans. Univ. Sci. Bul. 36: 248. ♂, ♀.  
**kincaidii** Cockerell. N. S. south to N. C. west to B. C., Calif., Ariz. Pollen: Unknown, but visits flowers of *Chamaenerion angustifolium*, *Eriogonum mariifolium*, *E. subscaposum*, *Heracleum*, *Horkelia bernardina*, *Medicago sativa*, *Melilotus alba*, *Mentha arvensis*, *Penstemon*, *Potentilla*, *Solidago californica*, *S. confinis*, *Sphenosciadium capitellatum*, *Symphoricarpos*.  
*Colletes kincaidii* Cockerell, 1898. Acad. Nat. Sci. Phila., Proc. 50: 52. ♀, ♂.  
*Colletes sieverti* Cockerell, 1906. Amer. Mus. Nat. Hist., Bul. 22: 424. ♂.  
*Colletes eulophi albertensis* Cockerell, 1938. Canad. Ent. 70: 70. ♀.  
*Colletes stricklandi* Cockerell, 1938. Canad. Ent. 70: 70. ♀.

- louisae** Cockerell. Tex. west to south. Calif.; Mexico. Pollen: Polylectic, produces two generations annually, the spring brood visits various Compositae (e.g., *Baileya*, *Encelia*, *Geraea*, *Lasthenia*, *Malacothrix*) and desert shrubs including *Agave*, *Cercidium* and *Larrea*. The autumnal brood obtains pollen exclusively from Compositae (e.g., *Chrysothamnus*, *Haplopappus*, *Lepidospartum*). Predator: *Philanthus gibbosus* (Fabr.).  
*Colletes louisae* Cockerell, 1897. Ann. and Mag. Nat. Hist. (6) 19: 46. ♂.  
*Colletes tucsonensis* Cockerell, 1906. Canad. Ent. 38: 163. ♂.
- rufocinctus** Cockerell. Minn. west to Alta., south to S. Dak., Colo., Ariz. Pollen: Polylege of Compositae including *Aster paniculatus*, *Grindelia squarrosa*, *Helianthus petiolaris*, *Solidago canadensis*, *S. rigida*, *Taraxacum vulgare*.  
*Colletes rufocinctus* Cockerell, 1929. Ann. and Mag. Nat. Hist. (10) 4: 298. ♂.  
*Colletes truncatus* Timberlake, 1943. Amer. Mus. Nat. Hist., Bul. 81: 396. ♀.
- simulans armatus** Patton. N. S. south to N. C., west to Nebr. and Alta. Pollen: Oligolege of autumnal flowering Compositae including *Aster ericoides*, *Baccharis*, *Bidens aristosa*, *Eupatorium*, *Solidago canadensis*, *S. graminifolia*, *S. nemoralis*, *S. ulmifolia*, but also visits *Cicuta maculata*, *Polygonum hydropiperoides* for nectar. Predator: *Philanthus albopilosus* Cress.  
*Colletes armata* Patton, 1879. Boston Soc. Nat. Hist., Proc. 20: 143. ♀, ♂.  
*Colletes scitula* Patton, 1879. Boston Soc. Nat. Hist., Proc. 20: 144. ♂.  
*Colletes spinosa* Robertson, 1891. Amer. Ent. Soc., Trans. 18: 60. ♀, ♂.
- Biology: Evans, 1975. Ent. Soc. Amer., Ann. 68: 891 (predator).
- simulans miamiensis** Mitchell. Fla. (Miami). Intergrades between *Colletes s. simulans* and *C. s. miamiensis* occur in Miss. and Tex. Pollen: Presumably oligolege of autumnal flowering Compositae, but has been collected only on one occasion at flowers of *Bidens pilosa*.  
*Colletes simulans miamiensis* Mitchell, 1951. Elisha Mitchell Sci. Soc., Jour. 67: 236. ♂.
- simulans nevadensis** Swenk. B. C., Wash., Oreg., Calif., Nev., Utah. Pollen: Oligolege of autumnal flowering Compositae including *Baccharis emoryi*, *Chrysothamnus vicidiflorus*, *Gutierrezia californica*, *G. confinis*, *G. sarothrae*, *Haplopappus acradenius*, *H. bernardina*, *H. pinifolius*, *H. vernonioides*, *Lepidospartum squamatum*, *Solidago lucida*, but also visits *Eriogonum* and *Melilotus alba* for nectar.  
*Colletes nevadensis* Swenk, 1908. Nebr. Univ., Dept. Ent. Contrib. 1: 52. ♂.
- simulans simulans** Cresson. Nebr. west to B. C., Colo., Ariz. Pollen: Oligolege of autumnal flowering Compositae including *Aster*, *Bigelovia wrightii*, *Grindelia*, *Senecio*.  
*Colletes simulans* Cresson, 1868. Boston Soc. Nat. Hist., Proc. 12: 168. ♂.  
*Colletes bigeloviae* Cockerell, 1897. Ann. and Mag. Nat. Hist. (6) 19: 40. ♀.  
*Colletes brevispinosus* Viereck, 1903. Amer. Ent. Soc., Trans. 29: 62. ♀.  
*Colletes tegularis* Swenk, 1905. Canad. Ent. 37: 304. ♀.  
*Colletes coloradensis* Cockerell, 1933. Ent. Soc. Amer., Ann. 26: 41. ♂.
- slevini** Cockerell. B. C. to Wyo., south to Calif. and Ariz.; Mexico (Baja California). Pollen: Polylectic, visiting a wide variety of flowers including *Adenostoma fasciculatum*, *A. sparsifolium*, *Amorpha fruticosa*, *Aster*, *Baccharis pilularis*, *Bigelovia*, *Ceanothus integerrimus*, *C. palmeri*, *Chrysanthemum*, *Chrysothamnus pumilis*, *Cirsium*, *Eriogonum elatum*, *E. elongatum*, *E. fasciculatum*, *E. latifolium nudum*, *E. plumatella*, *E. subscaposum*, *E. wrightii*, *Euphorbia albomarginata*, *Fremontia californica*, *Gutierrezia californica*, *G. lucida*, *Haplopappus palmeri*, *H. pinifolius*, *H. vernonioides*, *Heteromeles arbutifolia*, *Lepidium virginicum*, *Malvastrum thurberi*, *Melilotus*, *Nolina*, *Phacelia frigida*, *Rhamnus californica*, *Rhus trilobata*, *Ribes roezlii*, *Solidago californica*, *Sphenosciadium capitellatum*, *Stephanomeria exigua*.  
*Colletes slevini* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 185. ♀.  
*Colletes eriogoni* Cockerell, 1939. Pan-Pacific Ent. 15: 188. ♂, ♀.
- trigonatus** Cockerell. Colo.  
*Colletes trigonatus* Cockerell, 1933. Ent. Soc. Amer., Ann. 26: 42. ♀.
- utilis** Cockerell. N. Mex.  
*Colletes utilis* Cockerell, 1897. Ann. and Mag. Nat. Hist. (6) 19: 39. ♀.

- wootoni** Cockerell. Tex., N. Mex., Ariz. Pollen: Polylectic, visits flowers of *Amorpha fruticosa*, *Dasylium wheeleri*, *Helenium autumnale*, *H. laciniatum*, *Isocoma*, *Larrea tridentata*, *Melilotus alba*, *Nolium microcarpa*, *Phacelia*, *Petalostemon flavescens*, *Sapindus drummondii*, *Sphaeralcea laxa*, *Solidago occidentalis*, *Wislizenia refracta*.  
*Colletes wootoni* Cockerell, 1897. Ann. and Mag. Nat. Hist. (6) 19: 42. ♂.  
*Colletes apacheorum* Timberlake, 1943. Amer. Mus. Nat. Hist., Bul. 81: 401. ♀.

## SPECIES GROUP AESTIVALIS

- aestivalis** Patton. Mass. south to N. C. west to Tenn., Ill. Parasite: *Epeolus interruptus* Robt.?  
 Pollen: Unknown, but visits flowers of *Apocynum cannabinum*, *Heracleum lanatum*, *Heuchera americana*, *H. hispida*, *Krigia amplexicaulis*, *Polytaenia nuttallii*, *Rhus glabra*, *Ribes gracile*, *Rubus villosus*, *Taenidia integerrima*, *Zizia aurea*.  
*Colletes aestivalis* Patton, 1879. Boston Soc. Nat. Hist., Proc. 20: 142. ♀.  
*Colletes heucherae* Robertson, 1891. Amer. Ent. Soc., Trans. 18: 61. ♀, ♂.  
**andrewsi** Cockerell. Nebr., Colo., Wis., S. Dak., Man. Pollen: Apparently an oligolege of *Heuchera*.  
*Colletes Andrewsii* Cockerell, 1906. Ann. and Mag. Nat. Hist. (7) 17: 311. ♀.

## SPECIES GROUP ROBERTSONII

- kansensis** Stephen. Kans. Pollen: Unknown, but visits flowers of *Monarda punctata occidentalis*.  
*Colletes kansensis* Stephen, 1954. Kans. Univ. Sci. Bul. 36: 297, fig. 29. ♂.  
**larreae** Timberlake. South. Calif., Ariz. Pollen: Oligolege of *Larrea tridentata*; males also have been collected at flowers of *Acamptopappus sphaerocephalus*, *Barbarea orthoceras*.  
*Colletes larreae* Timberlake, 1951. Wasmann Jour. Biol. 9: 193. ♂, ♀.  
**metzi** Timberlake. Colo. (Boulder).  
*Colletes metzi* Timberlake, 1951. Wasmann Jour. Biol. 9: 192. ♂.  
**robertsonii** Dalla Torre. Ill. and Miss., west to Man., Colo., and N. Mex. Pollen: Unknown, but visits flowers of *Amorpha canescens*, *Monarda punctata occidentalis*, *Petalostemon candidus*, *P. purpureum*, *P. violaceum*.  
*Colletes punctata* Robertson, 1891. Amer. Ent. Soc., Trans. 18: 92. ♂. Preocc.  
*Colletes robertsonii* Dalla Torre, 1896. Cat. Hym., v. 10, p. 44. N. name.  
*Colletes robustus* Swenk, 1904. Ent. News 15: 251. ♀, ♂.  
**timberlakei** Stephen. Colo., Wyo. Pollen: Unknown, but visits flowers of *Petalostemon*.  
*Colletes timberlakei* Stephen, 1954. Kans. Univ. Sci. Bul. 36: 290, fig. 31. ♂.  
**turgiventris** Timberlake. Calif. Pollen: Unknown, but visits flowers of *Phacelia* including *P. hispida*.  
*Colletes turgiventris* Timberlake, 1951. Wasmann Jour. Biol. 9: 196. ♂, ♀.

## SPECIES GROUP NUDUS

- brimleyi** Mitchell. N. J., N. C., Ga., Fla. Pollen: Unknown, but visits flowers of *Ilex cassine*.  
*Colletes brimleyi* Mitchell, 1951. Elisha Mitchell Sci. Soc., Jour. 67: 231, figs. 14, 15. ♀, ♂.  
**nudus** Robertson. Ont. south to N. C. and La., west to Wis., Colo. Pollen: Unknown, but visits flowers of *Asclepias syriaca*, *Ceanothus*, *Daucus carota*, *Hydrangea arborescens*, *Melilotus alba*, *Monarda mollis*, *Parthenocissus*, *Pycnanthemum flexuosum*, *Rhus copallina*, *R. glabra*, *Symphoricarpos orbiculatus*, *S. vulgaris*, *Verbena urticifolia*.  
*Colletes nudus* Robertson, 1898. Acad. Sci. St. Louis, Trans. 8: 43. ♀, ♂.  
*Colletes Vierecki* Swenk, 1905. Canad. Ent. 37: 301. ♀.  
*Colletes hydrophilus* Cockerell, 1906. Ann. and Mag. Nat. Hist. (7) 17: 313. ♂.

## SPECIES GROUP AMERICANUS

- aberrans** Cockerell. Mich., west to Alta., Colo., and N. Mex. Pollen: Unknown, but visits flowers of *Melilotus*, *Petalostemon flavescens*, *P. villosum*.  
*Colletes aberrans* Cockerell, 1897. Ann. and Mag. Nat. Hist. (6) 19: 44. ♀.  
**albescens** Cresson. Wis. and Ill., west to Man., Utah, and N. Mex. Pollen: Unknown, but visits flowers of *Amorpha canescens*, *Petalostemon purpureum*.  
*Colletes albescens* Cresson, 1868. Boston Soc. Nat. Hist., Proc. 12: 168. ♀.

- americanus** Cresson. Que., Man. and United States east of Rocky Mts. Parasite: *Epeolus pusillus* Cress.? Pollen: Possibly oligolege of autumnal flowering Compositae, but has been collected from these and wide range of other plants including *Aster*, *Boltonia asteroides*, *Chrysopsis microcephala*, *Eupatorium altissimum*, *Gnaphalium polyccephalum*, *Helianthus divaricatus*, *Lactuca floridana*, *Lespedeza virginica*, *Lycopus americanus*, *Polygonum hydropiperoides*, *P. scandens*, *Rudbeckia trilobata*, *Sium cicutaeifolium*, *Solidago*. Predator: *Philanthus solivagus* Say.  
*Colletes americana* Cresson, 1868. Boston Soc. Nat. Hist., Proc. 12: 167. ♀, ♂.
- annae** Cockerell. N. Mex., Ariz. Pollen: Unknown, but visits flowers of *Baccharis*, *Solidago canadensis arizonica*.  
*Colletes annae* Cockerell, 1897. Ann. and Mag. Nat. Hist. (6) 19: 48. ♂.  
*Colletes crucis* Cockerell, 1902. Ent. News 13: 304. ♂.  
*Colletes cockerelli* Timberlake, 1951. Wasmann Jour. Biol. 9: 221. ♀.
- annae disseptus** Timberlake. South Calif.; Mexico (Baja Calif.). Pollen: Possibly oligolege of autumnal flowering Compositae including *Conium maculatum*, *Lepidospartum squamatum*, *Solidago*.  
*Colletes disseptus* Timberlake, 1951. Wasmann Jour. Biol. 9: 223. ♀, ♂.
- bradleyi** Mitchell. N. J. (Chatsworth and Chesilhurst).  
*Colletes bradleyi* Mitchell, 1951. Elisha Mitchell Sci. Soc., Jour. 67: 239. ♀.
- gypsicolens** Cockerell. B. C. to Calif., southeast to Colo. and N. Mex. Pollen: Possibly oligolege of autumnal flowering Compositae including *Aster*, *Chrysothamnus nauseosus*, *Haplopappus vernonioides*.  
*Colletes gypsicolens* Cockerell, 1897. Ann. and Mag. Nat. Hist. (6) 19: 47. ♂.
- howardi** Swenk. N. C. (Southern Pines). Parasite: *Epeolus howardi* Mitchell? Pollen: Unknown, but visits *Kuhnistera pinnata*.  
*Colletes howardi* Swenk, 1925. Amer. Mus. Novitates 186: 5. ♀, ♂.
- laticinctus** Timberlake. Nebr. west to Idaho, south to N. Mex. and Ariz. Pollen: Unknown, but visits *Gutierrezia sarothrae*, *Pectis papposa*, *Polygonum*.  
*Colletes laticinctus* Timberlake, 1951. Wasmann Jour. Biol. 9: 220. ♀.
- mandibularis** Smith. B. C., N. S., U. S., east of the Rocky Mts. Pollen: Unknown, but visits flowers of *Amorpha canadensis*, *Amphiachyris*, *Berlandiera subcaulis*, *Cassia fasciculata*, *Ceanothus*, *Cirsium*, *Erigeron quercifolius*, *E. ramosus*, *Flaveria linearis*, *Heterotheca subaxillaris*, *Isopappus divaricatus*, *Medicago sativa*, *Melilotus alba*, *M. indica*, *Prionopsis ciliata*, *Pycnanthemum flexuosum*.  
*Colletes mandibularis* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 5. ♂.  
*Colletes similis* Robertson, 1904. Canad. Ent. 36: 276. ♀. Preocc.  
*Colletes simulator* Michener, 1951. In Muesebeck et al., U. S. Dept. Agr., Agr. Monog. 2: 1048. N. name.
- micheneri** Stephen. Nebr. (Halsey).  
*Colletes micheneri* Stephen, 1954. Kans. Univ. Sci. Bul. 36: 357. ♂, ♀.
- mittelli** Stephen. U. S. east of Great Plains, except New England. Pollen: Unknown, but visits flowers of *Aster*, *Erigeron quercifolius*, *Haplopappus*, *Melilotus alba*, *Penstemon*, *Solidago*. It has also been collected at honey dew of *Phylloxera* on *Quercus alba*.  
*Colletes mittelli* Stephen, 1954. Kans. Univ. Sci. Bul. 36: 325, fig. 38. ♂, ♀.
- ochraceus** Swenk. Calif.; Mexico (Baja California). Pollen: Unknown, but visits flowers of *Eriogonum*, *Haplopappus vernonioides*, *Wislizenia refracta*.  
*Colletes ochraceus* Swenk, 1906. Canad. Ent. 38: 42. ♀.
- saritensis** Stephen. Tex. (near Sarita). Pollen: Unknown, but visits flowers of *Dalea grisea*.  
*Colletes saritensis* Stephen, 1954. Kans. Univ. Sci. Bul. 36: 341, fig. 43. ♂, ♀.
- solidaginis** Swenk. Mass. to Ga., west to Minn. and Nebr. Pollen: Unknown, but visits flowers of *Solidago*.  
*Colletes solidaginis* Swenk, 1906. Canad. Ent. 38: 40. ♀, ♂.
- susannae** Swenk. Wis. and Ill., west to Colo. and Alta. Pollen: Unknown, but visits flowers of *Helianthus*, *Kuhnistera purpurea*, *Petalostemon purpureum*, *P. violaceus*.  
*Colletes susannae* Swenk, 1925. Amer. Mus. Novitates 186: 1. ♀, ♂.

- telectivtris** Timberlake. Calif. Pollen: Possibly an oligolege of autumnal flowering Compositae, visiting flowers of *Eriogonum*, *Gutierrezia lucida* and *Haplopappus acradeniis*.  
*Colletes telectivtris* Timberlake, 1951. Wasmann Jour. Biol. 9: 218. ♀, ♂.
- thysanellae** Mitchell. Fla., Ga., N. C., Va. Pollen: Unknown, but visits flowers of *Aster*, *Baccharis*, *Eupatorium*, *Solidago*, and possibly *Thysanella*.  
*Colletes thysanellae* Mitchell, 1951. Elisha Mitchell Sci. Soc., Jour. 67: 238, figs. 18-20. ♀, ♂.
- wilmattae** Cockerell. Wis., Minn., Iowa, Man., Nebr., Tex., N. Mex. Pollen: Possibly an oligolege of *Petalostemon* having been collected only at the flowers of *Petalostemon candidum*, *P. flavescens*, *P. oligophyllum*.  
*Colletes wilmattae* Cockerell, 1904. Canad. Ent. 36: 14. ♀.

## SPECIES GROUP HYALINUS

- banksi** Swenk. Mich. and N. Y. south to Fla. Pollen: Unknown, but visits flowers of *Batodendron*, *Ilex glabra*.  
*Colletes banksi* Swenk, 1908. Nebr. Univ., Dept. Ent. Contrib. 1: 19. ♀.  
*Colletes ilicis* Mitchell, 1951. Elisha Mitchell Sci. Soc., Jour. 67: 234, figs. 12, 13. ♀, ♂.
- distinctus** Cresson. N. C., Ga., Fla. Pollen: Unknown, but visits flowers of *Hypericum*, *Ilex cassine*, *Melilotus alba*.  
*Colletes distinctus* Cresson, 1868. Boston Soc. Nat. Hist., Proc. 12: 167. ♂.  
*Colletes nitidus* Smith, 1879. Descr. New Species Hym. Coll. Brit. Mus., p. 1. ♀, ♂.  
*Colletes carolinus* Mitchell, 1951. Elisha Mitchell Sci. Soc., Jour. 67: 233. ♀.
- hyalinus gaudialis** Cockerell. South. Calif. Pollen: Unknown, but visits flowers of *Asclepias eriocarpa*, *Baccharis emoryi*, *Brassica*, *Eriogonum latifolium*, *Gutierrezia sarothrae*, *Haplopappus vernonioides*, *Heliotropium curassavicum*, *Hemizonia corymbosa*, *Melilotus alba*, *M. indica*, *Oenothera*, *Solidago*.  
*Colletes gaudialis* Cockerell, 1905. South. Calif. Acad. Sci. Bul. 4: 32.  
*Colletes gaudialis* Cockerell, 1905. South. Calif. Acad. Sci. Bul. 4: 106. Emend.  
*Colletes arenicola* Cockerell, 1926. Ann. and Mag. Nat. Hist. (9) 18: 626. ♀.
- hyalinus hyalinus** Provancher. N. S. and Maine, west to Alta., Yukon, Colo., and N. Mex. Pollen: Unknown, but visits flowers of *Achillea*, *Cirsium*, *Epilobium*, *Frasera*, *Kalmia*, *Melilotus*, *Rhus*, *Solidago*. Predator: *Philanthus albopilosus* Cress.  
*Colletes hyalinus* Provancher, 1888. Addit. Corr. Fauna Ent. Canada, Hym. p. 303. ♀, ♂.  
*Colletes spurcus* Viereck, 1903. Amer. Ent. Soc., Trans. 29: 58. ♀, ♂.  
*Colletes fraseriae* Swenk, 1908. Nebr. Univ., Dept. Ent. Contrib. 1: 41. ♂.  
*Colletes cauponarius* Cockerell, 1929. Ann. and Mag. Nat. Hist. (10) 4: 297. ♀.  
*Colletes nitidicaudus* Cockerell, 1929. Ann. and Mag. Nat. Hist. (10) 4: 299. ♂.
- Biology: Evans, 1975. Ent. Soc. Amer., Ann. 68: 891 (predator).
- hyalinus oregonensis** Timberlake. Coastal Oreg. and Calif. Pollen: Unknown, but visits flowers of *Achillea borealis arenicola*, *Armeria californica*, *Baccharis pilularis*, *Cakile edentula*, *Erigeron glaucus*, *Eriogonum*, *Polygonum paronychium*, *Potentilla*, *Silybum marianum*.  
*Colletes hyalinus oregonensis* Timberlake, 1951. Wasmann Jour. Biol. 9: 211. ♀, ♂.
- lutzi interior** Timberlake. Northeast. Calif., Nev., Oreg., Wash., Idaho. Pollen: Unknown, but visits flowers of *Melilotus alba*.  
*Colletes monticola interior* Timberlake, 1951. Wasmann Jour. Biol. 9: 214. ♀, ♂.
- lutzi lutzi** Timberlake. Idaho, Wyo., Utah, Colo., N. Mex. Pollen: Unknown, but visits flowers of *Chrysothamnus*, *Cleome serrulata*, *Melilotus*.  
*Colletes lutzi* Timberlake, 1943. Amer. Mus. Nat. Hist., Bul. 81: 390. ♀, ♂.
- lutzi monticola** Timberlake. Calif. (Sierra Nevada Mts.). Pollen: Unknown, but visits flowers of *Allium*, *Aster adscendens*, *Castanopsis*, *Chrysothamnus*, *Hemizonia corymbosa*, *Solidago elongata*.  
*Colletes monticola monticola* Timberlake, 1951. Wasmann Jour. Biol. 9: 212. ♀, ♂.  
*Colletes ingoensis* Timberlake, 1951. Wasmann Jour. Biol. 9: 215. ♀.

**lutzi pinorum** Timberlake. South Calif. (San Bernardino and San Jacinto mts.). Pollen:

Unknown, but visits flowers of *Aster*, *Cryptantha*, *Eriogonum molestum* var. *davidsonii*, *Gnaphalium thermale*, *Hemizonia wheeleri*, *Layia platyglossa*.

*Colletes monticola pinorum* Timberlake, 1951. Wasmann Jour. Biol. 9: 215. ♀, ♂.

**phaceliae** Cockerell. B. C. to Man., south to Iowa, Kans., N. Mex., Ariz., Calif. Pollen:

Unknown, but visits flowers of *Aster*, *Cleome serrulata*, *Epilobium spicatum*, *Grindelia*, *Helenium lacinatum*, *Malvastrum coccineum*, *M. cockerelli*, *Melilotus alba*, *Petalostemon*, *Phacelia*, *Psoralea tenuiflora*, *Ribes*, *Senecio douglasii*, *Solidago*, *Sphenosciadium capitellatum*, *Tetradymia spinosa*.

*Colletes phaceliae* Cockerell, 1906. Ann. and Mag. Nat. Hist. (7) 17: 315. ♀.

*Colletes salicicola geranii* Cockerell, 1906. Canad. Ent. 38: 163. ♂.

#### SPECIES GROUP INAEQUALIS

**inaequalis** Say. N. S. to Ga., west to Sask., Kans., Tex., Idaho and Wash. Parasite: *Tricrania sanguinipennis* Say. Pollen: Polylectic, visits flowers of *Acer*, *Aesculus glabra sargentii*, *Anemone virginiana*, *Arctostaphylos*, *Cercis canadensis*, *Claytonia palustris*, *Dendrium buxifolium*, *Dentaria*, *Lomatium foeniculaceum*, *Prunus*, *Pyrus ioensis*, *Rhamnus utilis*, *Rhus aromatica*, *R. canadensis*, *Ribes*, *Rubus*, *Salix*, *Spiraea vanhouttii*, *S. thunbergi*, *Taraxacum*, *Viburnum acerifolium*.

*Colletes inaequalis* Say, 1837. Boston Jour. Nat. Hist. 1: 391. ♀, ♂.

*Colletes propinqua* Cresson, 1868. Boston Soc. Nat. Hist., Proc. 12: 165. ♀.

*Colletes canadensis* Cresson, 1868. Boston Soc. Nat. Hist., Proc. 12: 166. ♂.

*Colletes inaequalis ferrugineus* Swenk, 1908. Nebr. Univ., Dept. Ent. Contrib. 1: 32. ♀, ♂.

Biology: Smith, 1898. Ent. News 9: 157 (as *compactus*). —Smith, 1900. N. Y. Ent. Soc., Jour. 8: 208 (as *compactus*). —Smith, 1901. N. Y. Ent. Soc., Jour. 9: 30 (as *compactus*). —Smith, 1901. N. Y. Ent. Soc., Jour. 9: 134. —Rau, 1922. Acad. Sci. St. Louis, Trans. 24 (7): 38. —Rau, 1934. Acad. Sci. St. Louis, Trans. 28: 219. —Stephen, 1954. Kans. Univ. Sci. Bul. 36: 155.

**thoracicus** Smith. Mass. to Fla., west to Okla. and Tex. Parasite: *Tricrania sanguinipennis* Say. Pollen: Polylectic, visits flowers of *Amelanchier*, *Aronia*, *Brassica*, *Ilex*, *Malus*, *Melilotus*, *Padus*, *Prunus angustifolia*, *Salix*, *Vaccinium*.

*Colletes thoracica* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 5. ♀, ♂.

*Colletes rufithorax* Swenk, 1906. Canad. Ent. 38: 42. ♀, ♂.

*Colletes pulcher* Swenk, 1906. Canad. Ent. 38: 43. ♂.

Biology: Parker and Boving, 1924. U. S. Natl. Mus., Proc. 64: 1-40. —Stephen, 1954. Kans. Univ. Sci. Bul. 36: 156.

**validus** Cresson. N. B. to N. C., west to Mich. Ecology: A vernal species of wet woods and swamplands. Pollen: Unknown, but visits flowers of *Chamaedaphne calyculata*, *Leucothoe racemosa*, *Prunus*, *Ribes oxycanthoides*, *R. rubrum*, *Vaccinium*, *V. corymbosum*.

*Colletes validus* Cresson, 1868. Boston Soc. Nat. Hist., Proc. 12: 165. ♀, ♂.

#### SPECIES GROUP IMPUNCTATUS

**impunctatus lacustris** Swenk. N. B. and N. H. west to B. C., Yukon, N. W. T., Alaska. Pollen: Unknown, but possibly visits flowers of *Gaylussacia*. Typical *impunctatus* Nylander is Palearctic.

*Colletes lacustris* Swenk, 1906. Ent. News 17: 257. ♀, ♂.

*Colletes vicinalis* Graenicher, 1911. Pub. Mus. City Milwaukee, Bul. 1: 228. ♀.

#### SPECIES GROUP WILLISTONI

**brevicornis** Robertson. United States east of Rocky Mts. Pollen: Unknown, but visits flowers of *Asclepias*, *Batodendron*, *Callirhoe involucrata*, *C. leiocarpa*, *Campanula*, *Crataegus*, *Melilotus alba*, *Opuntia*, *Pastinaca sativa*, *Psoralea onobrychis*, *Rubus*, *Specularia*.

*Colletes brevicornis* Robertson, 1897. Acad. Sci. St. Louis, Trans. 7: 315. ♂.

*Colletes opuntiae* Cockerell, 1906. Ann. and Mag. Nat. Hist. (7) 17: 312. ♂, ♀.

*Colletes brachyceros* Graenicher, 1935. Ent. Soc. Amer., Ann. 28: 301. Preocc.

Taxonomy: Robertson, 1900. Acad. Sci. St. Louis, Trans. 10: 51. ♀.

- willistoni** Robertson. N. S. to Utah, south to Tex. and Fla. Pollen: Unknown, but visits flowers of *Ceanothus americanus*, *Melilotus alba*, *Monarda punctata occidentalis*, *Physalis elliptii*, *P. virginiana*, *Psoralea tenuiflora*, *Pycnanthemum flexuosum*, *Rhus glabra*, *Toxicodendron*. Predator: *Philanthus albopilosus* Cress.  
*Colletes Willistoni* Robertson, 1891. Amer. Ent. Soc., Trans. 18: 60. ♀.  
 Taxonomy: Robertson, 1895. Amer. Ent. Soc., Trans. 22: 116. ♂.  
 Biology: Evans, 1975. Ent. Soc. Amer., Ann. 68: 891 (predator).

## SPECIES GROUP CONSORS

- californicus** Provancher. South. and Centr. Calif. Pollen: Possibly oligolege of *Phacelia*, visiting flowers of *Baccharis*, *Cryptantha intermedia*, *Layia platyglossa*, *Nemophila aurita*, *N. menziesii*, *Phacelia affinis*, *P. distans*, *P. tanacetifolia*.  
*Colletes californica* Provancher, 1895. Nat. Canad. 22: 189. ♀, ♂.
- chamaesarachae** Cockerell. Ariz., N. Mex. Pollen: Unknown, but visits flowers of *Chamaesaracha coronopus*.  
*Colletes chamaesarachae* Cockerell, 1897. Ann. and Mag. Nat. Hist. (6) 19: 49. ♀.
- consors consors** Cresson. Mont., Idaho, Wyo., Colo., Calif. (Mono Basin). Pollen: Possibly oligolege of Hydrophyllaceae, visiting flowers of *Hydrophyllum fendleri*, *Penstemon virens*, *Phacelia leucophylla*, *Taraxacum*.  
*Colletes consors* Cresson, 1868. Boston Soc. Nat. Hist., Proc. 12: 168. ♂.  
*Colletes zonatus* Viereck, 1903. Amer. Ent. Soc., Trans. 29: 59. ♂.  
*Colletes myroni* Cockerell, 1908. Entomologist 41: 293. ♀.
- consors mesocopus** Swenk. N. S. to N. W. T. south to Alta., Mass., Mich., Wis. Pollen: Unknown, but visits flowers of *Geranium*, *Kalmia*, *Rubus*.  
*Colletes mesocopus* Swenk, 1907. Canad. Ent. 39: 364. ♀, ♂.
- consors pascoensis** Cockerell. B. C. and Idaho, south to Calif. and Utah. Pollen: Unknown, but visits flowers of *Nemophila aurita*, *Phacelia*, *Physalis*, *Sedum obtusatum*.  
*Colletes pascoensis* Cockerell, 1898. Acad. Nat. Sci. Phila., Proc. 50: 51. ♂, ♀.
- linsleyi** Timberlake. Calif. (Blythe). Pollen: Unknown, but visits flowers of the introduced *Tamarix*.  
*Colletes linsleyi* Timberlake, 1951. Wasmann Jour. Biol. 9: 205. ♀.
- nigrifrons** Titus. North Que. to N. W. T. and Yukon, south into mts. of northeast Calif., Ariz., and N. Mex. Pollen: Unknown, but visits flowers of *Arenaria nuttallii*, *Drymocallis fissa*, *Eriogonum lobbiai*, *E. latifolium nudum*, *E. mariifolium*, *Linum lewisii*, *Mertensia sibirica*, *Oxytropis*, *Physalis*, *Polemonium*, *Potentilla anseriana*, *P. fruticosa*, *P. glandulosa*, *P. hippiana*, *Ranunculus*, *Spiraea densiflora*.  
*Colletes nigrifrons* Titus, 1900. Canad. Ent. 32: 304. ♀.  
*Colletes polemonii* Cockerell, 1906. Amer. Mus. Nat. Hist., Bul. 22: 425. ♂.  
*Colletes florissantia* Cockerell, 1906. Amer. Mus. Nat. Hist., Bul. 22: 425. ♂.
- nitescens** Timberlake. Calif. Pollen: Unknown, but visits flowers of *Salix*.  
*Colletes nitescens* Timberlake, 1951. Wasmann Jour. Biol. 9: 187. ♂, ♀.
- paniscus mertensiae** Timberlake. Calif. (Sierra Nevada and White mts.). Pollen: Unknown, but visits flowers of *Mertensia ciliata* var. *stomatechoides*.  
*Colletes paniscus mertensiae* Timberlake, 1951. Wasmann Jour. Biol. 9: 182. ♂, ♀.
- paniscus paniscus** Viereck. Mont. and Wyo. south into mts. of Ariz., and N. Mex. Pollen: Unknown, but visits flowers of *Houstonia*, *Iris missouriensis*, *Mertensia franciscana*, *Salix*.  
*Colletes paniscus* Viereck, 1903. Amer. Ent. Soc., Trans. 29: 60. ♂.  
*Colletes oromontis* Viereck, 1903. Amer. Ent. Soc., Trans. 29: 61. ♀.  
*Colletes pleuralis* Swenk, 1906. Ent. News 17: 259. ♀, ♂.  
*Colletes griseocens* Cockerell, 1930. Amer. Mus. Novitates 397: 4. ♂.
- paniscus sculleni** Timberlake. Wash. to Mont., south to Utah, Wyo., and Calif. Pollen: Unknown, but visits flowers of *Mertensia*.  
*Colletes paniscus sculleni* Timberlake, 1951. Wasmann Jour. Biol. 9: 183. ♂, ♀.



- scopiventer** Swenk. Tex., Ariz. and South. Calif. Pollen: Unknown, but visits flowers of *Baccharis emoryi*, *Brodiaea*, *Chamaesaracha conioides*, *Solanum rostratum*.  
*Colletes scopiventer* Swenk, 1908. Nebr. Univ., Dept. Ent. Contrib. 1: 46. ♀ (♂ misdet.).
- sphaeralceae** Timberlake. Calif., Ariz., Nev., Utah. Pollen: Apparently oligolege of *Sphaeralceae*, visiting flowers of *S. alata*, *S. ambigua*, *S. oreutti*, *S. rosacea*.  
*Colletes sphaeralceae* Timberlake, 1951. Wasmann Jour. Biol. 9: 189. ♂, ♀.
- swenki** Stephen. Tex., Kans. Pollen: Unknown, but visits flowers of *Acacia greggii*, *Chamaesaracha conioides*, *Coreopsis douglasii*, *Marrubium vulgare*, *Prosopis glandulosa*, *Quincula lobata*, *Rhus microphylla*.  
*Colletes swenki* Stephen, 1954. Kans. Univ. Sci. Bul. 36: 450, fig. 68. ♀, ♂.
- texanus crawfordi** Swenk. North. Tex. Pollen: Unknown, but visits flowers of *Physalis*.  
*Colletes crawfordi* Swenk, 1906. Ent. News 17: 257. ♀.
- texanus texanus** Cresson. South. Tex.  
*Colletes texana* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 249. ♀.
- wickhami** Timberlake. Kans., Tex., N. Mex., Ariz., South. Calif. Pollen: Unknown, but visits flowers of *Chrysothamnus nauseosus*, *Helenium laciniatum*, *Phacelia popei*, *Quincula lobata*.  
*Colletes wickhami* Timberlake, 1943. Amer. Mus. Nat. Hist., Bul. 81: 394. ♂.
- xerophilus cismontanus** Timberlake. Calif. (Hemet). Pollen: Unknown, but visits flowers of *Salix goodingii*.  
*Colletes cismontanus* Timberlake, 1951. Wasmann Jour. Biol. 9: 186. ♂, ♀.
- xerophilus sonoranus** Timberlake. N. Mex. (Pecos). Pollen: Unknown, but visits flowers of *Salix*.  
*Colletes xerophilus sonoranus* Timberlake, 1951. Wasmann Jour. Biol. 9: 186. ♀.
- xerophilus xerophilus** Timberlake. South. Calif. deserts. Pollen: Unknown, but visits flowers of *Salix*.  
*Colletes xerophilus xerophilus* Timberlake, 1951. Wasmann Jour. Biol. 9: 184. ♂, ♀.

## SPECIES GROUP INTERMIXTUS

- bulbotibialis** Stephen. N. Mex. (Belen).  
*Colletes bulbotibialis* Stephen, 1954. Kans. Univ. Sci. Bul. 36: 458, fig. 71. ♂.
- intermixtus** Swenk. Tex., N. Mex., Colo., Ariz., south. Calif. Pollen: Unknown, but visits flowers of *Cotoneaster integerrimus*, *Eriogonum fasciculatum*, *Gnaphalium beneolens*, *Gutierrezia sarothrae*, *Haplopappus palmeri*, *Lippia*, *Physalis ixocarpa*, *Schinus molle*, *Solanum douglasii*.  
*Colletes intermixtus* Swenk, 1905. Canad. Ent. 37: 302. ♀.  
*Colletes lippiarum* Cockerell, 1909. Canad. Ent. 41: 394. ♀.

## SPECIES GROUP CILIATUS

- beamerorum** Stephen. Tex.; Mexico (Chihuahua). Pollen: Unknown, but visits flowers of *Monarda punctata coryi*.  
*Colletes beamerorum* Stephen, 1954. Kans. Univ. Sci. Bul. 36: 465, fig. 73. ♂.
- ciliatoides** Stephen. Utah, Idaho. Parasite: *Epeolus pusillus* Cress. Pollen: Unknown, but visits flowers of *Cuscuta*.  
*Colletes ciliatoides* Stephen, 1954. Kans. Univ. Sci. Bul. 36: 463, fig. 74. ♂.
- Biology: Torchio, 1965. Kans. Ent. Soc., Jour. 38: 182-187.
- ciliatus** Patton. Va., Ill., Iowa, Nebr., Kans., Colo. Pollen: Unknown, but visits flowers of *Cuscuta*, *Eryngium yuccifolium*.  
*Colletes ciliata* Patton, 1979. U. S. Geol. Geog. Survey Bul. 5: 369. ♀.  
*Colletes speciosa* Robertson, 1891. Amer. Ent. Soc., Trans. 18: 62. ♀.  
*Colletes brevihirtus* Timberlake, 1943. Amer. Mus. Nat. Hist., Bul. 81: 395. ♂.

## SPECIES GROUP DALEAE

- algarobiae** Cockerell. Tex., N. Mex., Utah, Ariz., south Calif.; north. Mexico; deserts. Pollen: Apparently oligolege of *Prosopis* including *P. glandulosa*, *P. pubescens*, but also visits flowers of *Cercidium torreyanum*, *Dalea*, *Eriogonum*, *Melilotus*, *Rhus*.  
*Colletes algarobiae* Cockerell, 1900. Entomologist 33: 244. ♂, ♀.
- clypeonitens** Swenk. South Calif., Ariz., Nev., Utah, west. Tex. Parasite: *Epeolus mesillae* (Ckll.). Pollen: Oligolege of *Larrea tridentata*, but also visits flowers of *Cercidium floridum*, *Dalea polyadenia*.  
*Colletes clypeonitens* Swenk, 1906. Canad. Ent. 38: 39. ♀.
- covilleae** Timberlake. South. Calif., Ariz.; Mexico (Baja Calif.). Pollen: Apparently oligolege of *Larrea tridentata*.  
*Colletes covilleae* Timberlake, 1951. Wasmann Jour. Biol. 9: 231. ♂, ♀.
- daleae** Cockerell. Utah, Tex. to Calif.; Mexico (Baja Calif.). Pollen: Unknown, but visits flowers of *Dalea scoparia*, *Eriogonum fasciculatum*, *E. gracilentum*, *Prosopis*, *Rhus laurina*.  
*Colletes daleae* Cockerell, 1897. Ann. and Mag. Nat. Hist. (6) 19: 43. ♂.
- deserticola** Timberlake. N. Mex., Ariz., Calif.; Mexico (Baja Calif.). Parasite: *Epeolus pusillus* Cress. Pollen: Apparently oligolege of *Prosopis*, including *P. glandulosa*, but also visits flowers of *Melilotus indica*.  
*Colletes deserticola* Timberlake, 1951. Wasmann Jour. Biol. 9: 232. ♂, ♀.
- petalostemonis** Swenk. N. Dak. and Nebr. to Alta., Ariz., and Calif. Pollen: Unknown, but visits flowers of *Dalea polyadenia*, *Melilotus alba*, *Petalostemon flavescens*.  
*Colletes petalostemonis* Swenk, 1906. Canad. Ent. 38: 40. ♀, ♂.
- prosopidis** Cockerell. Tex., N. Mex., south. Calif.; north. Mexico; deserts. Pollen: Apparently oligolege of *Prosopis*, including *P. glandulosa* var. *torreyanum*, but also visits flowers of *Melilotus indica*.  
*Colletes prosopidis* Cockerell, 1897. Ann. and Mag. Nat. Hist. (6) 19: 46. ♂.
- salicicola** Cockerell. Tex. to south. Calif., deserts. Pollen: Polylege of a wide variety of plants, including *Acacia*, *Cercidium*, *Dalea*, *Eriogonum*, *Hyptis*, *Larrea*, *Prosopis*, but also visits flowers of *Asclepias*, *Phacelia* and *Salix* for nectar.  
*Colletes salicicola* Cockerell, 1897. Ann. and Mag. Nat. Hist. (6) 19: 50. ♀.
- solitarius** Timberlake. Calif. (Inyo Co.).  
*Colletes solitarius* Timberlake, 1951. Wasmann Jour. Biol. 9: 216. ♀.
- stepheni** Timberlake. Calif. (Riverside Co.). Pollen: Oligolege of *Larrea tridentata*, but also visits flowers of *Cercidium floridum* and *Geraea canescens* for nectar.  
*Colletes stepheni* Timberlake, 1958. Pan-Pacific Ent. 34: 143. ♂, ♀.
- Biology: Hurd and Powell, 1958. Pan-Pacific Ent. 34: 147-153, 1 fig. (nesting habits, male behavior).

## SPECIES GROUP ARIDUS

- aridus** Stephen. Tex., N. Mex. Pollen: Unknown, but visits flowers of *Phacelia popei*.  
*Colletes aridus* Stephen, 1954. Kans. Univ. Sci. Bul. 36: 494, fig. 75. ♂, ♀.

## SPECIES GROUP TITUSSENSIS

- titusensis** Mitchell. Fla. (Titusville, Tampa).  
*Colletes titusensis* Mitchell, 1951. Elisha Mitchell Sci. Soc., Jour. 67: 237, figs. 16, 17. ♂.

## SPECIES GROUP LONGIFACIES

- longifacies** Stephen. Fla. Pollen: Unknown, but visits flowers of *Liatris laevigata*.  
*Colletes longifacies* Stephen, 1954. Kans. Univ. Sci. Bul. 36: 500. ♀.
- Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 43.

## SPECIES GROUP UNASSIGNED

- platynema** Snelling. Ariz. (Huachuca Mts.). Pollen: Unknown, but visits flowers of *Acacia angustissima*.  
*Colletes platynema* Snelling, 1975. Los Angeles Co. Mus., Contrib. Sci. 267: 2, figs. 5-8. ♂, ♀.

## SUBFAMILY DIPHAGLOSSINAE

This is a New World group of large to very large, robust bees which occur in the tropics, subtropics as well as the warm temperate regions of both North and South America.

Taxonomy: Michener, 1966. Kans. Univ. Sci. Bul. 46: 717-751, 48 figs.

## TRIBE CAUPOLICANINI

## Genus PTILOGLOSSA Smith

*Ptiloglossa* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 7.

Type-species: *Ptiloglossa ducalis* Smith. Monotypic.

*Ptiloglossa* subg. *Ptiloglossodes* Moure, 1945. Arq. do Mus. Paranaense 4: 153.

Type-species: *Megacilissa tarsata* Friese. Orig. desig.

*arizonensis* Timberlake. Ariz. Pollen: Polylege of *Cassia bauhinioides*, *Larrea tridentata*, *Solanum elaeagnifolium*, *S. rostratum*; females also visit flowers of *Cucurbita foetidissima* for nectar.

*Ptiloglossa arizonensis* Timberlake, 1946. Pan-Pacific Ent. 22: 157. ♀.

Biology: Linsley, 1962. Pan-Pacific Ent. 38: 75-82. — Linsley and Cazier, 1970. Kans. Ent. Soc., Jour. 43: 251-261, 3 tables. — Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 19 (floral relationships).

*jonesi* Timberlake. Ariz. Pollen: Polylege of *Datura meteloides*, *Larrea tridentata*, *Solanum elaeagnifolium*, and *S. rostratum*.

*Ptiloglossa jonesi* Timberlake, 1946. Pan-Pacific Ent. 22: 158. ♀.

Biology: Linsley and Cazier, 1963. Pan-Pacific Ent. 39: 1-18. — Linsley and Cazier, 1970. Kans. Ent. Soc., Jour. 43: 251-261, 3 tables. — Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 20 (floral relationships).

## Genus CAUPOLICANA Spinola

Although a few species of this genus occur in tropical America, the largest numbers of species chiefly inhabit the warm temperate and subtropical regions of both continents. Most of the species have been described from Chile and only two of the five recognized subgenera are known to occur in southwestern United States.

## Genus CAUPOLICANA Subgenus CAUPOLICANA Spinola

*Caupolicana* Spinola, 1851. In Gay, Hist. Fis. Pol. Chile, Zool., v. 6, p. 212.

Type-species: *Caupolicana gayi* Spinola. Desig. by Sandhouse, 1943.

*Megacilissa* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 123.

Type-species: *Caupolicana fulvicollis* Spinola. Monotypic. (= *Megacilissa superba* Smith).

*Megalocilissa* Schulz, 1906. Spolia Hym., p. 243. Emend.

Taxonomy: Michener, 1966. Kans. Univ. Sci. Bul. 46: 732-736.

*electa* (Cresson). N. C., to Ga., northwest Fla., Ala. Pollen: Unknown, but visits flowers of *Gerardia* and *Trichostema dichotomum*.

*Megacilissa electa* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 221. ♂.

Taxonomy: Michener, 1966. Kans. Univ. Sci. Bul. 46: 736-738.

Biology: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 24 (seasonal activity and flight period).

*ocellata* Michener. Kans., N. Mex., Ariz., Tex.; Mexico (Chihuahua). Pollen: Apparently an oligolege of *Dalea* including *D. lanata*, *D. scoparia*, but visits flowers of *Gaura coccinea* and *Petalostemon flavescens* for nectar.

*Caupolicana* (*Caupolicana*) *ocellata* Michener, 1966. Kans. Univ. Sci. Bul. 46: 738, figs. 12, 23-27, 29. ♂, ♀.

Biology: Michener, 1966. Kans. Univ. Sci. Bul. 46: 739-740 (nest, floral relationships).

yarrowi (Cresson). Ariz., Utah (Zion Park), N. Mex., Tex.; Mexico. Pollen: Polylege of *Cassia bauhinioides*, *Datura meteloides*, *Hofmanseggia jamesii*, *Larrea tridentata*, *Mentzelia pumila*, *Solanum elaeagnifolium*, *S. rostratum*, but visits other flowers including *Aloysia wrightii*, *Eysenhardtia polystachya*, and *Melilotus alba* for nectar.  
*Megacilissa yarrowi* Cresson, 1875. Rpt. Geog. Geol. Explor. and Survey west of 100th Meridian, v. 5, p. 723. ♀.

Taxonomy: Michener, 1966. Kans. Univ. Sci. Bul. 46: 733-736, figs. 12, 13-17, 29. —Snelling, 1975. Los Angeles Co. Mus., Contrib. Sci. 267: 2 (geogr. records).

Biology: Cockerell and Porter, 1899. Ann. and Mag. Nat. Hist. (7) 4: 403. —Linsley and Hurd, 1959. Ent. News 70: 67. —Linsley, 1960. N. Y. Ent. Soc., Jour. 68: 13. —Linsley, 1962. Ent. Soc. Amer., Ann. 55: 158-159. —Linsley and Cazier, 1963. Pan-Pacific Ent. 39: 1-18.  
 —Michener, 1966. Kans. Univ. Sci. Bul. 46: 734-736. —Linsley and Cazier, 1970. Kans. Ent. Soc., Jour. 43: 251-261, 3 tables. —Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 18-19 (summary of habits and floral relationships).

### Genus CAUPOLICANA Subgenus ZIKANAPIS Moure

*Zikanapis* Moure, 1945. Arq. do Mus. Paranaense, 4: 147.

Type-species: *Ptiloglossa zikani* Friese. Orig. desig.

*Foersterapis* Moure, 1964. Studia Ent. 7: 441.

Type-species: *Zikanapis foersteri* Moure and Seabra. Orig. desig.

Taxonomy: Michener, 1966. Kans. Univ. Sci. Bul. 46: 727-728, figs. 12, 30-34, 47.

*elegans* Timberlake. Ariz. (Portal); Mexico (Tehuacan and Puebla). Pollen: Unknown, but visits flowers of *Salvia*.

*Caupolicana elegans* Timberlake, 1965. N. Y. Ent. Soc., Jour. 73: 46. ♂.

Taxonomy: Michener, 1966. Kans. Univ. Sci. Bul. 46: 743-745, fig. 47.

#### NOMEN NUDUM IN CAUPOLICANA SPINOLA

*Megacilissa monticola* Ashmead, 1889. In Cockerell, Colo. Biol. Assn. 10th Rpt., [p. 2].

Probably published originally in Custer County Courant newspaper.

### SUBFAMILY HYLAEINAE

The females of this subfamily, like those of the Australian subfamily Euryglossinae and most of those in the chiefly Neotropical subfamily Xeromelissinae, lack scopal hairs and transport pollen in the crop. The subfamily Hylaeinae is represented in North America only by the genus *Hylaeus*. The species of this genus make cells of a transparent cellophane-like material in preexisting burrows, hollow stems, holes or cavities.

Revision: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 60-85 (spp. of eastern U. S.).

Taxonomy: Lovell, 1910. Psyche 17: 177 (Maine). —Metz, 1911. Amer. Ent. Soc., Trans. 37: 85 (spp.). —Meade-Waldo, 1923. Gen. Ins., v. 181, p. 29 (cat.). —Cockerell and Sumner, 1931. Amer. Mus. Novitates 490: 14 (Rocky Mt. females). —Michener, 1942. N. Y. Ent. Soc., Jour. 50: 273 (subgenera). —Snelling, 1966. South. Calif. Acad. Sci., Bul. 65: 164-175 (Nearctic subgenera). —Warncke, 1970. Rech. Agron. Gembloux, Bul. 5 (n.s.): 745-747 (status of generic names *Hylaeus* and *Prosopis*).

### Genus HYLAEUS Fabricius

#### Genus HYLAEUS Subgenus PROSOPIS Fabricius

*Prosopis* Fabricius, 1804. Syst. Piezatorum, p. 293.

Type-species: *Mellinus bipunctatus* Fabricius. Desig. by Morice and Durant, 1914. (= *Sphex signata* Panzer).

*Prosopis* Ashmead, 1894. Psyche 7: 43. Emend.

Revision: Snelling, 1966. Los Angeles Co. Mus., Contrib. Sci. 98: 1-18 (spp. of western U. S.).  
*aenigmus* (Viereck). N. Mex. Possibly a synonym of *H. episcopalis* (Cockerell).

*Prosopis aenigmus* Viereck, 1903. Amer. Ent. Soc., Trans. 29: 64. ♂.

**affinis** (Smith). New England and adjacent Canada west to B. C., Wash., Idaho, south to Utah, Kans., Miss., and Ga. Pollen: Unknown, but visits a wide variety of flowers including *Amorpha*, *Apocynum*, *Aruncus*, *Asclepias*, *Blephilia*, *Boltonia*, *Campanula*, *Ceanothus*, *Cephalanthus*, *Cicuta*, *Clematis*, *Cornus*, *Crataegus*, *Cryptotaenia*, *Daucus carotus*, *Erigeron*, *Eryngium*, *Eulophus*, *Eupatorium*, *Euphorbia*, *Fragaria*, *Geranium*, *Geum*, *Gnaphalium*, *Heracleum*, *Houstonia*, *Hydrangea*, *Hypericum*, *Krigia*, *Lactuca*, *Lepidium*, *Lycopus*, *Malva*, *Melilotus*, *Nelumbo*, *Osmorrhiza*, *Oxypholis*, *Pastinaca*, *Petalostemon*, *Philadelphicus*, *Polygonum*, *Polytaenia*, *Potentilla*, *Ptelea*, *Pycnanthemum*, *Pyracantha*, *Rhus*, *Rubus*, *Salix*, *Salvia*, *Sanicula*, *Sium*, *Solidago*, *Stellaria*, *Stenanthium*, *Symphoricarpos*, *Taenidia*, *Thaspium*, *Valerianella*, *Veronica*, *Viburnum*, *Zizia*. **Predator:** *Philanthus crabroniformis* Sm., *P. politus* Say.

*Prosopis affinis* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 24. ♀ (♂ misdet.).

*Prosopis ziziae* Robertson, 1896. Canad. Ent. 28: 136. ♀, ♂.

*Prosopis ziziae dunningi* Cockerell, 1898. Entomologist 31: 188. ♂.

*Hylaenus albertensis* Cockerell, 1937. Canad. Ent. 69: 126. ♂, ♀.

**Taxonomy:** Snelling, 1966. Los Angeles Co. Mus., Contrib. Sci. 98: 3.

**confluens** (Smith). N. J. to Fla. Pollen: Unknown, but visits flowers of *Chrysanthemum*, *Chrysopsis*, *Erigeron*, *Eryngium*, *Hypericum*, *Ilex*, *Itea*, *Melilotus*, *Oxydendrum*, *Oxypholis filiformis*, *Polygonum*, *Rhus*, *Solidago*.

*Prosopis confluens* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 24. ♀.

*Prosopis triangularis* Cockerell, 1896. Psyche 7 (sup.): 31. ♂.

**episcopalis coquilletti** (Cockerell). Oreg. and Idaho south to Mexico (Baja California and Sonora) east to Texas. Pollen: Unknown, but visits flowers of *Acamptopappus*, *Agave deserti*, *Asclepias subulata*, *Aster abatus*, *Baileya pleniradiata*, *Chamaebatiaria millefolium*, *Croton californicus*, *Dalea californica*, *D. fremontii*, *D. saundersii*, *D. schottii*, *Datura meteloides*, *Eriodictyon californicum*, *Eriogonum fasciculatum*, *E. inflatum*, *Gilia davyi*, *Haplopappus cooperi*, *Hyptis emoryi*, *Isomeris arborea*, *Larrea tridentata*, *Lepidium fremontii*, *Lupinus formosus*, *Melilotus alba*, *Peucephyllum schottii*, *Prosopis juliflora glandulosa*, *Sphaeralcea orcuttii*, *Stanleya pinnata*, *Tamarix gallica*.

*Prosopis coquilletti* Cockerell, 1896. Psyche 7 (sup.): 439. ♂.

**Taxonomy:** Snelling, 1966. Los Angeles Co. Mus., Contrib. Sci. 98: 10 (as *H. rugulosus episcopalis*). —Snelling, 1975. Los Angeles Co. Mus., Contrib. Sci. 267: 8 (tax. status).

**episcopalis episcopalis** (Cockerell). Alta., south to Calif. and N. Mex. Pollen: Unknown, but visits a wide variety of flowers including *Achillea lanulosa*, *A. millaefolium*, *Adenostoma fasciculatum*, *Angelica tomentosa*, *Anthemis cotulla*, *Apocynum adrosaemifolium*, *Asclepias fascicularis*, *A. mexicana*, *Baccharis douglasii*, *Calochortus venustus*, *Ceanothus integerrimus*, *Chaetopappa aurea*, *Chamaebatiaria foliolosa*, *Clarkia bilobata*, *Erigeron ramosus*, *Eriodictyon californicum*, *Eriogonum fasciculatum*, *E. inflatum*, *E. latifolium nudum*, *E. virgatum*, *Eriophyllum confertiflorum*, *Eryngium aristatum*, *Geranium richardsonii*, *Gnaphalium californicum*, *Gutierrezia californica*, *G. sarothrae*, *Haplopappus cooperi*, *Heteromeles arbutifolia*, *Linanthus montanus*, *Lupinus*, *Oxypholis occidentalis*, *Penstemon breviflorus*, *Perideridia gairdneri*, *Phacelia*, *Prunus ilicifolia*, *Rhamnus californica*, *Scrophularia californica*, *Solidago*, *Stanleya pinnata*, *Sweetia parryi*, *Trichostema parishii*.

*Prosopis episcopalis* Cockerell, 1896. Psyche 7 (sup.): 29. ♂.

*Prosopis universitatis* Cockerell, 1906. Ann. and Mag. Nat. Hist. (7) 17: 225. ♂.

**Taxonomy:** Snelling, 1966. Los Angeles Co. Mus., Contrib. Sci. 98: 9, 10 (as *H. rugulosus rugulosus* and *H. r. episcopalis*). —Snelling, 1975. Los Angeles Co. Mus., Contrib. Sci. 267: 8 (synonymy, tax. status).

**episcopalis giffardiellus** Cockerell. Calif. (Sacramento and San Joaquin Valleys). Pollen: Unknown, but visits flowers of *Melilotus alba*, *Raphanus sativus*, *Rosa californica*, *Rubus*, *Salix*, *Trifolium repens*.

*Hylaenus giffardiellus* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 186. ♂.

**Taxonomy:** Snelling, 1966. Los Angeles Co. Mus., Contrib. Sci. 98: 11 (as *H. rugulosus giffardiellus*). —Snelling, 1975. Los Angeles Co. Mus., Contrib. Sci. 267: 8 (tax. status).

**episcopalis metzi** Snelling. South. Calif. Pollen: Unknown, but visits a wide variety of flowers including *Adenostoma fasciculatum*, *Amorpha fruticosa*, *Achillea millefolium*, *Apocynum androsaemifolium*, *Chrysopsis villosa*, *Cordylanthus nevini*, *Encelia*, *Eriogonum davidsonii*, *E. elongatum*, *E. fasciculatum*, *E. fasciculatum* var. *polifolium*, *E. gracile*, *E. nudum*, *E. subscaposum*, *E. wrightii*, *Eriodictyon*, *Geranium richardsonii*, *Gilia gilioides*, *Haplopappus cooperi*, *Lupinus cytisoides*, *Melilotus alba*, *Mentzelia laevicaulis*, *Monardella linoidea*, *Penstemon grinnellii*, *P. labrosus*, *P. palmeri*, *Phacelia ramosissima*, *Potentilla glandulosa*, *Rhamnus californica*, *R. crocea*, *Salvia carnosa*, *Solidago californica*, *S. confinis*, *Sphenosciadium capitellatum*.  
*Hylaeus (Prosopis) rugulosus metzi* Snelling, 1966. Los Angeles Co. Mus., Contrib. Sci. 98: 12. ♀, ♂.

Taxonomy: Snelling, 1975. Los Angeles Co. Mus., Contrib. Sci. 267: 8 (tax. status).

**flammipes** (Robertson). Fla. (Citrus Co.).

*Prosapis flammipes* Robertson, 1893. Amer. Ent. Soc., Trans. 20: 273. ♀.

Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 64.

**gaigei** (Cockerell). Mich. Possibly a synonym of *H. modestus* Say.

*Prosopis gaigei* Cockerell, 1916. Mich. Univ. Mus. Zool., Occas. Papers 23: 2. ♀.

Taxonomy: Snelling, 1970. Los Angeles Co. Mus., Contrib. Sci. 180: 27.

**illinoisensis** (Robertson). Ill. and W. Va. to N. Y., Mass., Maine. Pollen: Unknown, but visits flowers of *Apocynum cannabinum*, *Aruncus*, *Aster*, *Cicuta*, *Cornus*, *Crataegus*, *Eulophus*, *Gonolobus*, *Heracleum*, *Lycopus*, *Osmorrhiza*, *Pastinaca*, *Rhus*, *Salix*, *Solidago*, *Taenidia*, *Thaspium*, *Viburnum*.

*Prosopis Illinoisensis* Robertson, 1896. Canad. Ent. 28: 138. ♂.

*Hylaeus (Prosopis) certus* Mitchell, 1951. Elisha Mitchell Sci. Soc., Jour. 67: 241, figs. 4-7. ♂, ♀. Preocc.

Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 64.

**insolitus** Snelling. Ariz., Tex.; Mexico (Chihuahua). Pollen: Unknown, but visits flowers of *Cleome serrulata*.

*Hylaeus (Prosopis) insolitus* Snelling, 1966. Los Angeles Co. Mus., Contrib. Sci. 98: 16. ♂, ♀.

**modestus citrinifrons** (Cockerell). B. C., Alta., Mont., Wyo., Colo., N. Mex., Calif., Nev. Pollen: Unknown, but visits a wide variety of flowers including *Adenostoma fasciculatum*, *Angelica arguta*, *A. tomentosa*, *Aralia californica*, *Baccharis douglasii*, *Chaenactis glabriuscula lanosa*, *Eriodictyon californicum*, *Eriogonum nudum*, *Eriophyllum staechadifolium*, *Geranium dissectum*, *G. richardsoni*, *Gnaphalium californicum*, *Holodiscus discolor*, *Melilotus alba*, *Oxybaphis occidentalis*, *Perideridia gairdneri*, *Phacelia humilis*, *Potentilla glandulosa*, *Ranunculus*, *Rhamnus californica*, *Rubus*, *Salvia sonomensis*, *Scrophularia californica*, *Solidago*, *Sphenosciadium capitellatum*, *Trichostema parishii*.

*Prosapis citrinifrons* Cockerell, 1896. Psyche 7 (sup.): 27. ♂.

*Prosapis rugosulus* Cockerell, 1896. Psyche 7 (sup.): 28. ♂.

*Prosapis rugosulus* var. *fallax* Cockerell, 1896. Psyche 7 (sup.): 28. ♂.

Taxonomy: Snelling, 1966. Los Angeles Co. Mus., Contrib. Sci. 98: 5. —Snelling, 1975. Los Angeles Co. Mus., Contrib. Sci. 267: 7-8 (synonymy, tax. status).

**modestus modestus** Say. East. Canada and Atlantic States to Minn., La. Parasite:

*Gasteruption kirbii* Westw. Pollen: Unknown, but visits a wide variety of flowers including *Acer*, *Achillea*, *Amorpha*, *Angelica*, *Apocynum*, *Arabis*, *Aralia*, *Aruncus*, *Azalea*, *Cacalia*, *Castanea pumila*, *Ceanothus*, *Chrysanthemum*, *Cicuta maculata*, *Cornus*, *Crataegus*, *Daucus carota*, *Erigeron*, *Eulophus*, *Eupatorium*, *Gerardia*, *Geum*, *Heracleum*, *Houstonia purpurea*, *Hydrangea*, *Ilex*, *Koellia*, *Lepidium*, *Malva*, *Monarda*, *Osmorrhiza*, *Pastinaca*, *Ptelea*, *Pycnanthemum*, *Pyracantha*, *Rhus*, *Rubus*, *Sanicula*, *Sium*, *Solidago*, *Spiraea*, *Symphoricarpos*, *Taenidia*, *Thaspium*, *Zizia*. Predator: *Philanthus bilunatus* Cr., *P. politus* Say.

*Hylaeus modestus* Say, 1837. Boston Jour. Nat. Hist. 4: 392. ♀ (♂ misdet.).

*Prosapis pennsylvanica* Cockerell, 1896. Psyche 7: 439. ♂.

*Prosopis nucleolus* Viereck, 1903. Amer. Ent. Soc., Trans. 29: 64. ♀.

*Prosopis sayi* Robertson, 1904. Canad. Ent. 36: 274, 275. ♀, ♂.

*Prosopis minyra* Lovell, 1909. Ent. News 20: 413. ♂.

*Prosopis binghami* Lovell, 1910. Psyche 17: 180. ♂.

*Prosopis supracurta* Swenk and Cockerell, 1910. Ent. News 21: 71. ♂.

Biology: Rau, 1922. Acad. Sci. St. Louis, Trans. 24: 71. — Rau, 1930. Psyche 37: 173-175.

— Krombein, 1967. Trap-nesting wasps and bees, p. 262. — Medler, 1966. Ent. Soc. Wash., Proc. 68: 131.

**nelumbonis** (Robertson). Ill. and Ohio to Fla., Ala., La. Pollen: Unknown, but visits flowers of *Castalia tuberosa*, *Nelumbo lutea*.

*Prosopis nelumbonis* Robertson, 1890. Amer. Ent. Soc., Trans. 17: 316. ♀.

Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 67.

**ornatus** Mitchell. N. C. to Fla. Pollen: Unknown, but visits flowers of *Cephalanthus*, *Hypericum*, *Melilotus*, *Parthenocissus*.

*Hylaeus* (*Prosopis*) *ornatus* Mitchell, 1951. Elisha Mitchell Sci. Soc., Jour. 67: 242, figs. 8-11. ♂, ♀.

Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 67.

**schwarzii** (Cockerell). Mass. to Fla. Pollen: Unknown, but visits flowers of *Hydrocotyle umbellata*, *Medicago lupulina*, *Melilotus alba*, *Sagittaria*, *Salix*.

*Prosopis Schwarzii* Cockerell, 1896. Ent. Monthly Mag. 32: 218. ♀.

*Prosopis fossata* Metz, 1911. Amer. Ent. Soc., Trans. 37: 135. ♂ (♀ misdet.).

Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 68.

**transvittatus** (Cockerell). South. Ariz. (mts.); Mexico (Durango, D. F. and Veracruz).

*Prosopis transvittata* Cockerell, 1917. Ann. and Mag. Nat. Hist. (8) 20: 437. ♀, ♂.

**volusiensis** Mitchell. Fla. (Dade and Volusia Cos.).

*Hylaeus* (*Prosopis*) *volusiensis* Mitchell, 1951. Elisha Mitchell Sci. Soc., Jour. 67: 245. ♀, ♂.

Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 69.

#### Genus HYLAEUS Subgenus PARAPROSOPIS Popov

*Prosopis* subg. *Paraprosopis* Popov, 1939. Acad. des Sci. U. R. S. S., Compt. Rend. (Dok.) (n. s.) 25: 169.

Type-species: *Prosopis pictipes* (Nylander). Monotypic and orig. design.

Revision: Snelling, 1970. Los Angeles Co. Mus., Contrib. Sci. 180: 27-58, figs. 7-12 (Nearctic species).

#### SPECIES GROUP ASININUS

**asininus** (Cockerell and Casad). West. Tex. to South. Calif.; Mexico (Baja California). Parasite:

*Anthrax irroratus irroratus* Say. Pollen: Unknown, but visits flowers of *Baccharis emoryi*, *Chrysothamnus paniculatus*, *Gutierrezia lucida*, *Haplopappus acradenius*, *Eriogonum fasciculatum*, *Lepidospartum*, *Prosopis*, *Solidago californica*.

*Prosopis asininus* Cockerell and Casad, 1895. Amer. Ent. Soc., Trans. 22: 299. ♂.

*Prosopis bipes* Cockerell and Casad, 1895. Amer. Ent. Soc., Trans. 22: 300. ♀.

*Prosopis asinina* var. *bigeloviae* Cockerell, 1898. N. Mex. Univ., Bul. 1: 72. ♀.

Biology: Krombein, 1967. Trap-nesting wasps and bees, p. 261 (nest, parasite).

#### SPECIES GROUP CALVUS

**calvus** (Metz). South. Oreg. to Mexico (Baja California), Nev., Ariz. Pollen: Unknown, but visits flowers of *Baccharis*, *Ceanothus cordulatus*, *C. cuneatus*, *C. integrerrimus*, *Collinsia heterophylla*, *Eriodictyon californicum*, *Eriogonum*, *Fremontia californica*, *Holodiscus discolor*, *Lepidum virginicum*, *Penstemon antirrhinoides*, *Photinia heteromeles*, *Prunus ilicifolia*, *Rhamnus californicus*, *R. crocea*, *Salix*.

*Prosopis calvus* Metz, 1911. Amer. Ent. Soc., Trans. 37: 143. ♂.

- georgicus** (Cockerell). N. Y., N. C., Ga., Fla., Tex. Pollen: Unknown, but visits flowers of *Crataegus*, *Hydrangea*, *Pyracantha*, *Salix*.  
*Prosopis georgica* Cockerell, 1898. *Psyche* 7 (sup.): 438. ♂.  
*Prosopis georgica* var. *leana* Cockerell, 1909. *Ann. and Mag. Nat. Hist.* (8) 4: 27. ♂.  
*Hylaeus* (Metziella) *hydrangeae* Mitchell, 1951. *Elisha Mitchell Sci. Soc., Jour.* 67: 244. ♀.  
**timberlakei** Snelling. Calif. (Sierra Nevada Mts.). Pollen: Unknown, but visits flowers of *Ceanothus integerrimus*, *Eriodictyon californicum*, *Eriogonum nudum*, *Haplopappus arborescens*, *Lessingia leptoclada*, *Perideridia gairdneri*, *Solidago californica*.  
*Hylaeus* (Paraprosopis) *timberlakei* Snelling, 1970. *Los Angeles Co. Mus., Contrib. Sci.* 180: 50. ♂, ♀.

## SPECIES GROUP MEGALOTIS

- megalotis** (Swenk and Cockerell). Mont., Colo., Nebr., Utah, Ariz. Pollen: Unknown, but visits flowers of *Cleome serrulata*, *Chrysothamnus*, *Eriogonum aureus*.  
*Prosopis megalotis* Swenk and Cockerell, 1910. *Ent. News* 21: 69. ♂, ♀.

## SPECIES GROUP SONORENSIS

- sonorensis** Cockerell. Ariz., south. Calif.; Mexico (Baja California and Sonora). Pollen: Unknown, but visits flowers of *Eucelia*, *Eriogonum inflatum*, *Eucnide urens*, *Prosopis glandulosa*, *Scrophularia californica*, *Stanleya pinnata*.  
*Hylaeus sonorensis* Cockerell, 1924. *Calif. Acad. Sci., Proc.* (4) 12: 530. ♀.  
*Hylaeus sonorensis* var. *melanorhinus* Cockerell, 1924. *Calif. Acad. Sci., Proc.* (4) 12: 531. ♀.

## SPECIES GROUP WOOTONI

- coloradensis** (Cockerell). B. C., Wash., Idaho, Colo., N. Mex., Ariz., Utah, Nev., east. and south. Calif. Pollen: Unknown, but visits flowers of *Achillea lanulosa*, *A. millaefolium*, *Adenostoma fasciculatum*, *Baccharis pilularis*, *Barbarea orthoceras*, *Ceanothus cordulatus*, *Chrysothamnus nauseosus*, *C. nauseosus consimilis*, *Descurainia sophia*, *Erigeron canadensis*, *E. pygmaeus*, *Eriodictyon californicum*, *Eriogonum elegans*, *E. lobbii*, *E. mariifolium*, *E. latifolium nudum*, *E. subscaposum*, *E. umbellatum*, *E. virgatum*, *Gnaphalium thermale*, *Haplopappus arborescens*, *Holodiscus boursieri*, *Ivesia muirii*, *Lasthenia chrysostoma*, *Lepidospartum squamatum*, *Mentzelia laevicaulis*, *Orypolis occidentalis*, *Penstemon davidsonii*, *P. newberryi*, *Potentilla glandulosa*, *Rhamnus californica*, *Rhus*, *Solidago californica*, *S. multiradiata*, *Sphenosciadium capitellatum*.  
*Prosopis coloradensis* Cockerell, 1896. *Psyche* 7 (sup.): 30. ♂.  
**cooki** (Metz). N. Mex., Nev. (Churchill Co.), Ariz., south. Calif. Pollen: Unknown, but visits flowers of *Asclepias tuberosa*, *Chrysothamnus stenophyllus*, *Erigeron canadensis*, *Eriogonum aureum*, *E. fasciculatum*, *E. inflatum*, *E. plumatella*, *Fallugia*, *Gutierrezia lucida*, *Haplopappus gracilis*, *H. linearifolius*, *Lepidospartum*, *Nolina parryi*, *Petalostemon candidum*, *Phacelia ramosissima*, *Prosopis*, *Rhus trilobata*, *Salvia dorii*, *S. vitosa*, *Solidago californica*, *Sphaeralcea ambigua*, *Tetradymia canescens*.  
*Prosopis cookii* Metz, 1911. *Amer. Ent. Soc., Trans.* 37: 139. ♂ (♀ misdet.).  
**floridanus** (Robertson). Maine, Minn., Mich., Ill., Ky., N. C., Ga., Fla. Pollen: Unknown, but visits flowers of *Aster*, *Cornus paniculata*, *Erigeron quercifolius*, *Eulophus americanus*, *Ilex*, *Polygonella polygama*, *Pyracantha*, *Solidago*.  
*Prosopis floridanus* Robertson, 1893. *Amer. Ent. Soc., Trans.* 20: 273. ♀.  
*Prosopis eulophi* Robertson, 1905. *Canad. Ent.* 37: 236. ♀, ♂.  
*Hylaeus* (Paraprosopis) *packardi* Mitchell, 1951. *Elisha Mitchell Sci. Soc., Jour.* 67: 244. ♂.  
**luniceraterius** Snelling. Idaho (Craters of the Moon National Monument), Calif. Pollen: Unknown, but visits flowers of *Chamaebatia millefolium*, *Chrysothamnus nauseosus*, *C. viscidiflorus*, *Eriogonum nudum*, *E. ovalifolium*, *Phacelia leucophylla*, *Populus tremuloides*, *Senecio serra*.  
*Hylaeus* (Paraprosopis) *luniceraterius* Snelling, 1970. *Los Angeles Co. Mus., Contrib. Sci.* 180: 46. ♂, ♀.



**nevadensis** (Cockerell). B. C., Wash., Idaho, Oreg., Calif., Nev. Pollen: Unknown, but visits flowers of *Achillea lanulosa*, *Adenostoma fasciculatum*, *Angelica tomentosa*, *Apocynum androsaemifolium*, *Baccharis douglasii*, *Ceanothus cuneatus*, *C. integerrimus*, *C. soredatus*, *Centaurea melitensis*, *Cicuta*, *Collinsia*, *Cordylanthus rigidus*, *Corethrogyne filaginifolia*, *Eriodictyon californicum*, *E. crassifolium*, *E. trichocalyx*, *Erigeron heterophyllus*, *Eriogonum latifolium nudum*, *E. saxatile*, *E. wrightii*, *Eriophyllum confertiflorum*, *Geranium richardsonii*, *Gnaphalium californicum*, *Haplopappus arborescens*, *H. parishii*, *Holodiscus discolor*, *Horkelia bernardina*, *Monardella linoidea*, *M. odoratissima*, *Penstemon labrosus*, *Perideridia gairdneri*, *Phacelia humilis*, *Potentilla glandulosa*, *Prunus ilicifolia*, *Rhamnus californica*, *R. crocea*, *Solidago californica*, *S. occidentalis*, *Tetradymia canescens*.

*Prosopis nevadensis* Cockerell, 1896. *Psyche* 7 (sup.): 32. ♂.

*Prosopis hesperiphila* Cockerell, 1910. *Ann. and Mag. Nat. Hist.* (8) 5: 29. ♂.

*Hylaues oregonensis* Bridwell, 1919. *Hawaii. Ent. Soc., Proc.* 4: 160. ♀, ♂.

**personatellus** (Cockerell). Colo. (Corona and Ouray), Calif. (Sierra Nevada Mts.). Pollen:

Unknown, but visits flowers of *Aster*, *Brodiaea gracilis*, *Chrysothamnus nauseosus*, *Erigeron pygmaeus*, *Eriogonum elatum*, *E. lobbii*, *E. mariifolium*, *E. nudum*, *E. ovalifolium*, *Ivesia muiri*, *Monardella odoratissima*, *Penstemon davidsonii*, *P. newberryi*, *Perideridia gairdneri*, *Potentilla glandulosa*, *Solidago multiradiata*.

*Prosopis personatellus* Cockerell, 1915. *Ann. and Mag. Nat. Hist.* (8) 16: 485. ♀.

**polifolii** (Cockerell). Calif. Parasite: *Eurytoma stigmii* Ashm. Pollen: Unknown, but visits

flowers of *Achillea millaeifolium*, *Adenostoma fasciculatum*, *Alyssum maritimum*, *Anaphalis margaritacea*, *Baccharis douglasii*, *B. emoryi*, *B. glutinosa*, *B. pilularis*, *B. viminea*, *Ceanothus crassifolius*, *C. greggii*, *C. integerrimus*, *C. leucodermis*, *C. soredatus*, *Chrysothamnus nauseosus*, *Coreopsis lanceolata*, *Cryptantha intermedia*, *Dendromecon rigida*, *Erigeron canadensis*, *E. stenophyllus*, *Eriodictyon trichocalyx lanatum*, *Eriogonum elongatum*, *E. fasciculatum*, *E. gracile*, *E. latifolium*, *E. latifolium nudum*, *E. vimineum*, *Eriophyllum confertiflorum*, *Eryngium aristatum*, *Erysimum perenne*, *Euphorbia albomarginata*, *Gnaphalium beneolens*, *G. californicum*, *Gutierrezia californica*, *G. sarothrae*, *Haplopappus arborescens*, *H. linearifolius*, *H. parishii*, *Helenium puberulum*, *Heteromeles arbutifolia*, *Heterotheca grandiflora*, *Lasthenia*, *Malacothrix tenuifolia*, *Melilotus alba*, *Mentha*, *Opuntia*, *Penstemon antirrhinoides*, *Perideridia*, *Phacelia distans*, *Prunus demissa*, *P. ilicifolia*, *Pyracantha*, *Rhamnus californica*, *R. crocea*, *Rhus diversiloba*, *R. laurina*, *R. trilobata*, *Salix lasiolepis*, *Salvia*, *Sambucus caerulea*, *Scrophularia californica*, *Sedum*, *Senecio californica*, *Solidago californica*, *S. occidentalis*, *Sphenosciadium capitellatum*, *Swertia parryi*, *Tetradymia canescens*, *Trichostema parishii*.

*Prosopis polifolii* Cockerell, 1901. *Canad. Ent.* 33: 281. ♂.

*Hylaues polifolii catalinensis* Cockerell, 1938. *Ann. and Mag. Nat. Hist.* (11) 2: 150. ♂, ♀.

**wootoni** (Cockerell). B. C. to Calif., Ariz., N. Mex.; Mexico (Chihuahua). Pollen: Unknown, but

visits flowers of *Achillea lanulosa*, *Apocynum androsaemifolium*, *Aster canescens*, *Calochortus paludicola*, *C. splendens*, *Ceanothus cordulatus*, *C. palmeri*, *Chrysothamnus nauseosus*, *C. pumilus*, *C. viridulus*, *C. viscidiflorus puberulus*, *Eriodictyon trichocalyx*, *Eriogonum davidsonii*, *E. fasciculatum*, *E. nudum*, *E. subscaposum*, *E. umbellatum*, *E. wrightii*, *E. wrightii membranaceum*, *Eriophyllum*, *Erysimum asperum*, *Haplopappus arborescens*, *H. uniflorus gossypinus*, *H. parishii*, *Horkelia fusca*, *Lepidium virginicum*, *Mentzelia albicaulis*, *Phacelia imbricata*, *Potentilla glandulosa*, *Ranunculus californicus*, *Rhamnus californicus*, *Solidago californica*, *S. confinis*, *Tetradymia canescens*.

*Prosopis wootoni* Cockerell, 1896. *Psyche* 7 (sup.): 26. ♂.

*Prosopis divergens* Cockerell, 1896. *Psyche* 7 (sup.): 29. ♂.

*Prosopis clandestinus* Viereck, 1903. *Amer. Ent. Soc., Trans.* 17: 65. ♂.

*Prosopis excavata* Swenk and Cockerell, 1910. *Ent. News* 21: 70. ♀.

*Hylaues perparvus* Cockerell and Sumner, 1931. *Amer. Mus. Novitates* 490: 10. ♂.

#### SPECIES GROUP UNASSIGNED

**seclusus** Cockerell and Sumner. Colo.

*Hylaues seclusus* Cockerell and Sumner, 1931. *Amer. Mus. Novitates* 490: 12. ♂.

Genus *HYLAEUS* Subgenus *PROSOPELLA* Snelling

*Hylaeus* subg. *Prosopelella* Snelling, 1966. Biol. Soc. Wash., Proc. 79: 139.

Type-species: *Hylaeus hurdi* Snelling. Monotypic and orig. desig.

Revision: Snelling, 1966. Biol. Soc. Wash., Proc. 79: 139-144.

*hurdi* Snelling. Ariz.; Mexico (Chihuahua). Pollen: Unknown, but visits flowers of *Baccharis*, *Ceanothus* including *C. greggii*, *Melilotus alba*, *Penstemon campanulatus*, *Verbesina*.

*Hylaeus (Prosopelella) hurdi* Snelling, 1966. Biol. Soc. Wash., Proc. 79: 140, fig. 1. ♂, ♀.

Genus *HYLAEUS* Subgenus *HYLAEANA* Michener

*Hylaeus* subg. *Hylaeana* Michener, 1954. Amer. Mus. Nat. Hist., Bul. 104: 28.

Type-species: *Hylaeus panamensis* Michener. Monotypic and orig. desig.

*panamensis* Michener. Tex. west to South. Calif., south to Panama. Pollen: Unknown, but visits flowers of *Dicraurus*, *Hyptis emoryi*, *Verbesina encelioides*.

*Hylaeus (Hylaeana) panamensis* Michener, 1954. Amer. Mus. Nat. Hist., Bul. 104: 28. ♂.

Taxonomy: Snelling, 1968. Los Angeles Co. Mus., Contrib. Sci. 144: 4 (as *H. aztecus*).

—Snelling, 1975. Los Angeles Co. Mus., Contrib. Sci. 267: 8 (tax. status).

Genus *HYLAEUS* Subgenus *HYLAEUS* Fabricius

*Hylaeus* Fabricius, 1793. Ent. system., v. 2, p. 302.

Type-species: *Apis annulata* Linnaeus. Desig. by Latreille, 1810 (= *Prosopis annulata* Fabricius).

Revision: Snelling, 1970. Los Angeles Co. Mus., Contrib. Sci. 180: 1-27, figs. 1-6.

## SPECIES GROUP BISINUATUS

*bisinuatus* Forster. Holarctic; Transcont. south. Canada and north. U. S., south to Ga. and Calif. (Central Valley); introduced into Hawaii; Europe. Possibly introduced from Europe into the area around Fargo N. D. prior to 1912. Pollen: Exhibits a pronounced tendency toward oligolecty on flowers of the family Leguminosae, especially the introduced species of *Melilotus*, but also visits the flowers of other, mostly introduced, plants including those of the Amaranthaceae, Asclepiadaceae, Compositae, Cruciferaceae, Polygonaceae, Salicaceae, Tamaricaceae, Umbelliferae.

*Hylaeus bisinuatus* Forster, 1871. Zool.-Bot. Gesell. Wien, Verhandl. 21: 935. ♀, ♂.

*Prosopis leptocephala* Morawitz, 1871. Soc. Ent. Ross., Horae 7: 324. ♀, ♂.

*Prosopis (Hylaeus) discrepans* Schenck, 1875. Deut. Ent. Ztschr. 19: 326. ♂.

*Prosopis stevensi* Crawford, 1913. Canad. Ent. 45: 155. ♂, ♀.

*Prosopis incompleta* Alfken, 1937. Ist. Ent. Bologna, Bol. 9: 104. ♀.

Taxonomy: Snelling, 1970. Los Angeles Co. Mus., Contrib. Sci. 180: 26-27 (as *H. stevensi*).

—Snelling, 1975. Los Angeles Co. Mus., Contrib. Sci. 267: 8-9 (synonymy).

Biology: Barrows, 1975. Psyche 82: 74-75 (nest).

## SPECIES GROUP CONSPICUUS

*conspicuous* (Metz). Wash., Oreg., Idaho, Calif., Nev., Wyo. Pollen: Unknown, but visits flowers of *Anthemis cotula*, *Asclepias*, *Baccharis*, *Calochortus luteus*, *Ceanothus soredatus*, *Centaurea solstitialis*, *Eriodictyon californicum*, *Eriogonum fasciculatum*, *Eryngium aristatum*, *Foeniculum vulgare*, *Frankenia grandiflora*, *Gnaphalium californicum*, *Grindelia*, *Hemizonia pungens*, *Lasthenia*, *Medicago sativa*, *Melilotus*, *Phacelia distans*, *Prunus ilicifolia*, *Salix*, *Salsola kali*, *Solidago elongata*, *Trichostema*. Predator: *Philanthus pulcher* Dalla Torre.

*Prosopis conspicua* Metz, 1911. Amer. Ent. Soc., Trans. 37: 114. ♂, ♀.

*maritimus* Bridwell. Calif. (coastal sand dunes). Pollen: Unknown, but visits flowers of *Achillea borealis arenicola*, *Agoseris aparagoides*, *Eriogonum*, *Grindelia robusta platyphylla*, *Hemizonia corymbosa* var. *barclayi*, *Phacelia distans*, *Polygonum paronychia*.

*Hylaeus maritimus* Bridwell, 1910. Hawaii. Ent. Soc., Proc. 4: 159. ♂, ♀.

## SPECIES GROUP MESILLAE

**fedorica** (Cockerell). Mich. to Minn., south to Tex. and east to N. C. Pollen: Unknown, but visits flowers of *Crataegus*, *Daucus*, *Pyracantha*.

*Prosopis digitata* var. *fedorica* Cockerell, 1909. Ann. and Mag. Nat. Hist. (8) 4: 27. ♂.

*Prosopis grossicornis* Swenk and Cockerell, 1910. Ent. News 21: 67. ♂.

**granulatus** (Metz). Nev., Calif., ?Colo.

*Prosopis rudbeckiae* var. *granulatus* Metz, 1911. Amer. Ent. Soc., Trans. 37: 114. ♂.

**labiatifrons** (Cockerell). Ga. Possibly a synonym of *H. cressoni cressoni* (Cockerell).

*Prosopis labiatifrons* Cockerell, 1896. Psyche 7 (sup.): 437. ♂.

**mesillae cressoni** (Cockerell). Transcont. from south. Canada to north. Mexico. Ecology: Nests in twigs of *Symphoricarpos*. Parasite: *Rhydinofoenus floridanus bradleyi* Townes, *R. visaliae* Bradley. Pollen: Polylectic, visits a wide variety of flowers including *Achillea millefolium*, *A. lanulosa*, *Adenostoma fasciculatum*, *Alyssum maritimum*, *Amorpha*, *Anethum*, *Anthemis cotula*, *Apium graveolens*, *Apocynum*, *Aruncus*, *Asclepias fascicularis*, *A. mexicana*, *A. parishii*, *Aster adscendens delectabilis*, *Atriplex semibaccata*, *Baccharis douglasii*, *B. emoryi*, *B. glutinosa*, *B. pilularis*, *Blephilia*, *Boltonia*, *Brassica oleracea*, *Cacalia*, *Capsella*, *Cardamine*, *Castanea*, *Castanopsis*, *Ceanothus crassifolius*, *C. cuneatus*, *C. integerrimus*, *Cerastium*, *Chamaebatia foliolosa*, *Chrysothamnus consimilis*, *C. nauseosus speciosus*, *Cicuta*, *Cirsium vulgare*, *Cleome*, *Cleomella obtusifolia*, *Cornus*, *Crataegus*, *Cryptantha angustifolia*, *Cryptotaenia*, *Datura meteloides*, *Daucus carota*, *Descurainia sophia*, *Encelia farinosa*, *Epilobium*, *Eremocarpus setigerus*, *Erigeron canadensis*, *Eriodictyon californicum*, *Eriogonum elongatum*, *E. gracile*, *E. fasciculatum*, *E. nodosum*, *E. nudum*, *E. saxatile*, *E. subscaposum*, *E. vimineum*, *E. wrightii*, *Eriophyllum confertiflorum*, *Eryngium aristatum*, *Eschscholzia caespitosa*, *E. californica*, *Eulophus*, *Eupatorium*, *Euphorbia albomarginata*, *Evonymus*, *Foeniculum vulgare*, *Fragaria*, *Galium*, *Geum*, *Gnaphalium californicum*, *Gutierrezia californica*, *G. sarothrae*, *Haplopappus arborescens*, *H. palmeri*, *Heliotropium curvassavicum*, *Heracleum*, *Heteromeles arbutifolia*, *Holodiscus discolor*, *Hydrangea*, *Krigia*, *Lasthenia chrysostoma*, *L. gracilis*, *Lepidium*, *Lepidospartum*, *Lotus americanus*, *Lupinus paynei*, *Lycopus*, *Malus*, *Malva*, *Maytenus boaria*, *Melilotus alba*, *Mentha pulegium*, *Monardella lanceolata*, *Nemophila menziesii*, *Oenothera tanacetifolia*, *Osmorrhiza*, *Oxypolis*, *Parthenium*, *Pastinaca*, *Perideridia gairdneri*, *Phacelia distans*, *P. ramosissima*, *Philibertia heterophylla*, *Polygonum*, *Polytaenia*, *Potentilla glandulosa*, *Prosopis*, *Prunus ilicifolia*, *Pycnanthemum*, *Pyracantha*, *Rhamnus californica*, *R. crocea*, *Rhus diversiloba*, *Rosa*, *Rubus*, *Salix exigua*, *S. goodingii*, *S. laevigata*, *S. lasiolepis*, *S. nigra*, *Salvia apiana*, *S. mellifera*, *S. officinalis*, *S. stachyoides*, *Sanicula*, *Schinus molle*, *Scrophularia californica*, *Sedum*, *Sisymbrium irio*, *Sium*, *Solidago californica*, *S. occidentalis*, *Stanleya pinnata*, *Swertia parryi*, *Taenidia*, *Tamarix gallica*, *Tetradymia canescens*, *Thaspium*, *Trichostema lanceolatum*, *T. parishii*, *Valerianella*, *Verbena lasiostachys*, *Veronica*, *Viburnum*, *Zizia*.

*Prosopis pygmaea* Cresson, 1869. Boston Soc. Nat. Hist., Proc. 12: 272. ♂. Preocc.

*Prosopis cressoni* Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 20: 131. N. name.

*Prosopis pasadenae* Cockerell, 1910. Ann. and Mag. Nat. Hist. (8) 5: 30. ♂, ♀.

*Prosopis telepora* Lovell, 1911. Ent. News 22: 213. ♀, ♂.

*Hylaues laciniatus* Cockerell and Sumner, 1931. Amer. Mus. Novitates 490: 9. ♂.

*Hylaues repolitus* Cockerell and Sumner, 1931. Amer. Mus. Novitates 490: 13. ♀.

Biology: Rau, 1922. Acad. Sci. St. Louis, Trans. 24: 36 (as *pygmaeus* and *cressoni*). —Hicks, 1926. Colo. Univ., Studies 15: 221.

Morphology: Blum and Bohart, 1972. Ent. Soc. Amer., Ann. 65: 274 (mandibular gland pheromones).

**mesillae mesillae** (Cockerell). Nebr., Kans., Tex. west to Nev., Calif.; Mexico (Baja California, Chihuahua, Coahuila, Nuevo Leon and Sonora). Populations in Colo. and Utah are largely sympatric with those of the nominate subspecies and hybridization occurs in these areas. Pollen: Unknown, but visits flowers of *Croton californicus*, *Datura*

- meteloides*, *Encelia farinosa*, *Eriogonum fasciculatum*, *E. heermannii*, *Melilotus alba*, *Prosopis*, *Sphaeralcea ambigua*.
- Prosopis subtilis* Cockerell, 1895. Amer. Ent. Soc., Trans. 22: 295. ♀. Preocc.
- Prosopis mesillae* Cockerell, 1896. Canad. Ent. 28: 42. N. name.
- Prosopis cressoni* var. *magniclavus* Swenk and Cockerell, 1910. Ent. News 21: 68. ♂, ♀.
- rudbeckiae** (Cockerell and Casad). Canada (Ontario), transcont. U. S. from Conn.? N. J., ?Ala. to Rocky Mts. and Pacific Coast. Pollen: Unknown, but in California visits flowers of *Achillea millefolium*, *Alyssum maritimum*, *Angelica arguta*, *Anthemis cotula*, *Asclepias*, *Baccharis douglasii*, *B. emoryi*, *B. glutinosa*, *B. viminea*, *Calochortus venustus*, *Calyptidium umbellatum*, *Chrysothamnus*, *Cirsium*, *Ceanothus crassifolius*, *Descurainia sophia*, *Eriodictyon californicum*, *Eriogonum elatum*, *E. fasciculatum*, *E. latifolium nudum*, *E. vimineum*, *Foeniculum vulgare*, *Horkelia fusca*, *Lasthenia chrysostoma*, *Mimulus*, *Phacelia distans*, *Potentilla glandulosa*, *Ranunculus californicus*, *Rhus diversiloba*, *Salix goodingii*, *Sedum*, *Sisymbrium*, *Solidago*, *Symphoricarpos*, *Trichostema lanatum*, *Veronica americana*.
- Prosopis rudbeckiae* Cockerell and Casad, 1895. Amer. Ent. Soc., Trans. 22: 380. ♂.
- Prosopis bakeri* Cockerell, 1896. Psyche 7 (sup.): 26. ♂.
- Prosopis digitatus* Cockerell, 1896. Psyche 7 (sup.): 30. ♂.
- Prosopis rudbeckiae ruidosensis* Cockerell, 1896. Psyche 7 (sup.): 30. ♂.
- Prosopis rudbeckiae subdigitata* Cockerell, 1896. Psyche 7 (sup.): 31. ♂.
- saniculae** (Robertson). Canada (Ontario, Nova Scotia), and New England States west to Minn., south to Tenn., Ga. Pollen: Unknown, but visits flowers of *Achillea*, *Amorpha fruticosa*, *Apocynum cannabinum*, *Aruncus sylvester*, *Cicuta maculata*, *Crataegus crus-galla*, *Cryptotaenia canadensis*, *Eulophus americanus*, *Heracleum lanatum*, *Polygonum scandens*, *Sanicula canadensis*, *S. marilandica*, *Taenidia integerrima*, *Thaspium aureum trifoliatum*.
- Prosopis saniculae* Robertson, 1896. Canad. Ent. 28: 137. ♂, ♀.
- sejunctus** Snelling. Ariz. (Yuma), Nev. (Searchlight), south. Calif. deserts; Mexico (Mexicali). Pollen: Unknown, but visits flowers of *Croton californicus*, *Cryptantha barbiger*, *Heliotropium curassavicum*, *Hyptis emoryi*, *Isomeris arborea*, *Melilotus*, *Phacelia*, *Prosopis glandulosa* var. *torreyana*, *Salix*, *Tamarix gallica*.
- Hylaeus (Hylaeus) sejunctus* Snelling, 1970. Los Angeles Co. Mus., Contrib. Sci. 180: 18, figs. ♂, ♀.

## SPECIES GROUP ELLIPTICUS

- ellipticus** (Kirby). Alaska to Nova Scotia and Newfoundland, New England States south to Ga., west to Pacific Coast States. Parasite: *Aetoxys analis* Ashm., *Chrysis parvula* Fabr., *Coelopencyrtus hylaeoleter* Burks, *Encyrtus* sp., *Gasteruption assectator* (L.). Pollen: Unknown, but visits flowers of *Acer apicatum*, *Arenaria*, *Aruncus*, *Ceanothus*, *Chrysanthemum*, *Eriogonum marifolium*, *Houstonia purpurea*, *Hydrangea*, *Malus*, *Oxypholis*, *Penstemon heterodoxus*, *P. newberryi*, *Potentilla glandulosa*, *Rhus*, *Rosa*, *Rubus*, *Solidago multiradiata*, *Sphenosciadium capitellatum*, *Taraxacum*. Predator: *Philanthus pulcher* Dalla Torre.
- Prosopis elliptica* Kirby, 1837. Fauna Bor.-Amer., v. 4, p. 266. ♀.
- Prosopis antennata* Cresson, 1869. Boston Soc. Nat. Hist., Proc. 12: 271. ♂.
- Prosopis varifrons* Cresson, 1869. Boston Soc. Nat. Hist., Proc. 12: 270. ♀.

Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 71.

Biology: Davidson, 1895. Psyche 7: 315-316. — Fye, 1965. Canad. Ent. 97: 864-865, fig. 1, table 1 (nest). — Medler, 1966. Ent. Soc. Wash., Proc. 68: 131.

## SPECIES GROUP VERTICALIS

- verticalis** (Cresson). Southeast Canada and transcont. U. S. Pollen: Unknown, but visits flowers of *Allium haematochiton*, *Apocynum androsaemifolium*, *Arctostaphylos patula*, *Asclepias*, *Baccharis*, *Ceanothus cordulatus*, *C. integerrimus*, *C. soredatus*, *Chamaebatia foliolosa*, *Collinsia heterophylla*, *Cryptantha intermedia*, *Diplacus auriantiacus*, *Eriodictyon californicum*, *E. trichocalyx*, *Eriogonum*, *Eriophyllum multicaule*,

*Erysimum*, *Euphorbia crenulata*, *Heracleum lanatum*, *Horkelia parryi*, *Lomatium dasycarpum*, *Lupinus*, *Malus*, *Microseris nutans*, *Nemophila aurita*, *Penstemon grinnelli*, *P. palmeri*, *Phacelia distans*, *P. humilis*, *Potentilla glandulosa*, *Prunus subcordata*, *Rhamnus californicus*, *R. crocea*, *R. rubra*, *Ribes*, *Rosa californica*, *Rubus leucodermis*, *Salix*, *Scrophularia californica*, *S. laciniata*, *Solidago canadensis*, *S. multiradiata*, *Tamarix*. Predator: *Philanthus politus* Say.

*Prosopis verticalis* Cresson, 1869. Boston Soc. Nat. Hist., Proc. 12: 271. ♂.

*Prosopis tridentulus* Cockerell, 1896. Psyche 7 (sup.): 27. ♂.

*Prosopis tridens* Cockerell, 1896. Psyche 7 (sup.): 28. ♂.

*Prosopis subtristis* Swenk and Cockerell, 1910. Ent. News 21: 70. ♀.

*Prosopis melitina* Lovell, 1911. Ent. News 22: 214. ♀.

Biology: Fye, 1965. Canad. Ent. 97: 867, table 1 (nest).

### Genus HYLAEUS Subgenus CEPHALYLAEUS Michener

*Hylaeus* subg. *Cephalylaeus* Michener, 1942. N. Y. Ent. Soc., Jour. 50: 273.

Type-species: *Prosopis basalis* Smith. Orig. desig.

Revision: Snelling, 1968. Los Angeles Co. Mus., Contrib. Sci. 144: 1-3.

**basalis** (Smith). Transcont. in U. S., south. Canada (montane areas, alpine in southern distribution). Pollen: Unknown, but exhibits a decided preference for flowers of the Rosaceae; visits a wide variety of flowers including *Arctostaphylos patula*, *Calochortus leichtlinii*, *Ceanothus*, *Chamaebatia foliolosa*, *Cymopterus terebinthus*, *Erigeron coulteri*, *Eriogonum marifolium*, *Horkelia fusca*, *Oxyopsis occidentalis*, *Phyllodoce breweri*, *Potentilla fruticosa*, *P. glandulosa*, *Rhamnus californica*, *Rubus*, *Sphenosciadium capitellatum*, *Veronica americana*. Predator: *Philanthus pulcher* Dalla Torre.

*Prosopis basalis* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 22. ♀, ♂.

Biology: Fye, 1965. Canad. Ent. 97: 864, table 1 (nest).

**nunemacheri** Bridwell. Calif. (sea level to moderate elevations in the Coast Ranges and Sierra Nevada). Pollen: Unknown, but exhibits a decided preference for the flowers of the Rosaceae; visits a wide variety of flowers including *Arctostaphylos patula*, *Baccharis*, *Ceanothus cordulatus*, *C. cuneatus*, *C. greggii*, *C. integerrimus*, *C. soredatus*, *Chamaebatia foliolosa*, *Cryptantha*, *Eriodictyon angustifolium*, *E. californicum*, *Phacelia distans*, *Prunus emarginata*, *Ranunculus occidentalis*, *Rhamnus californicus*, *R. crocea*, *Rhus diversiloba*, *Salix lasiolepis*, *Solidago californica*, *Thysanocarpus curvipes*.

*Hylaeus Nunemacheri* Bridwell, 1919. Hawaii. Ent. Soc., Proc. 4: 157. ♀.

### Genus HYLAEUS Subgenus METZIELLA Michener

*Hylaeus* subg. *Metziella* Michener, 1942. N. Y. Ent. Soc., Jour. 50: 273.

Type-species: *Prosopis potens* Metz. Monotypic and orig. desig. (= *Prosopis sparsa* Cresson).

Revision: Snelling, 1968. Los Angeles Co. Mus., Contrib. Sci. 144: 3-4.

**sparsus** (Cresson). Canada (Quebec), eastern U. S. (Mich. to N. Y. south to Ga.) west to Tex.

Pollen: Unknown, but visits flowers of *Eulophus americanus*, *Osmorrhiza longistylis*, *Thaspium aureum trifoliatum*.

*Prosopis sparsa* Cresson, 1869. Boston Soc. Nat. Hist., Proc. 12: 271. ♀.

*Prosopis thaspiae* Robertson, 1898. Acad. Sci. St. Louis, Trans. 8: 43. ♀.

*Prosopis potens* Metz, 1911. Amer. Ent. Soc., Trans. 37: 103. ♂.

### Genus HYLAEUS Subgenus Unassigned

**formosus** Krombein. Fla. (Key Largo, Stock Is.); West Indies (Bahamas). Pollen: Unknown, but visits flowers of *Metopium toxiferum*.

*Hylaeus formosus* Krombein, 1953. Amer. Mus. Novitates 1633: 19. ♀.

*Hylaeus metopii* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 80. ♀.

- Taxonomy: Krombein, 1967. U. S. Dept. Agr., Agr. Monog. 2, Sup. 2, p. 423.  
*gracilicollis* Mitchell. Fla. (Miami, Key Largo, Plantation Key, and Saddlebunch Keys). Pollen:  
 Unknown, but visits flowers of *Metopium toxiferum*, *Flaveria linearis*.  
*Hylaesus gracilicollis* Mitchell, 1951. Elisha Mitchell Sci. Soc., Jour. 67: 240. ♀.  
 Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 79. —Snelling, 1966. South.  
 Calif. Acad. Sci., Bul. 65: 174.  
*suffusus* (Cockerell). Nev. Possibly a *Paraprosopis*.  
*Prosopis suffusa* Cockerell, 1896. Psyche 7 (sup.): 32. ♂.  
 Taxonomy: Snelling, 1966. South. Calif. Acad. Sci., Bul. 65: 174. —Snelling, 1970. Los Angeles  
 Co., Mus., Contrib. Sci. 180: 58.  
*tuertonis* (Cockerell). N. Mex. (Tuerto Mts. near Santa Fe), Colo. (Florissant). Possibly a  
*Paraprosopis* and may be a synonym of *H. wootoni* (Cockerell).  
*Prosopis tuertonis* Cockerell, 1906. Amer. Mus. Nat. Hist., Bul. 22: 423. ♀.

## Family OXAEIDAE

This small family of moderately large-sized bees occurs only in the Western Hemisphere. Although as a group the Oxaeidae are primarily centered in the tropics, a few species are present in the warm temperate areas of both North and South America. Some of the species commence flight activity about sunrise and at least the males of one species, *Protoxaea gloriosa* (Fox), cluster in large aggregations on selected plants where they spend the night.

The known intrafloral relationships of these bees suggest a rather narrow dependence upon relatively few sources of pollen. These include only certain genera within the plant families Leguminosae, Solanaceae, and Zygophyllaceae. However, the males and females seek nectar from a comparatively wide variety of plants since the flowers of some of the preferred pollen sources produce little or no nectar and large quantities of nectar are required to meet the bioenergetic needs of these fast-flying bees.

Revision: Hurd and Linsley, 1976. Smithsn. Contrib. Zool. 220: 1-75, 68 figs., 3 pls., 2 maps, 2 tables (included genera and spp., behavior, intrafloral ecology, summary of biological literature).

Taxonomy: Friese, 1898. K. K. Naturhist. Hofmus., Ann. 13: 59-86 (tax. characters, tax. position). —Schrottky, 1913. Soc. Cient. Argentina, An. 75: 114-115, 180-286 (tax. position). —Michener, 1944. Amer. Mus. Nat. Hist., Bul. 82: 246 (tax. characters, tax. status). —Moure, 1946. Bol. Agr. 4: 12-13 (tax. characters). —Moure, 1950. Dusenía 1: 303-306 (tax. characters, tax. status). —Rozen, 1964. N. Y. Ent. Soc., Jour. 72: 223-230, 7 figs. (tax. characters, tax. status). —Rozen, 1965. Amer. Mus. Novitates 2224: 1-18 (immature stages, tax. status). —Michener, 1965. Amer. Mus. Nat. Hist., Bul. 130: 10 (tax. status). —Graf, 1966. Ciencia e Cultura 18: 137-138 (tax. characters, tax. status). —Linsley and Cazier, 1972. Amer. Mus. Novitates 2509: 1-25, 4 tables (tax. status). —Roberts, 1973. Kans. Ent. Soc., Jour. 46: 437-446 (tax. status).

Biology: Linsley and Cazier, 1972. Amer. Mus. Novitates 2509: 1-25, 4 tables (behavior). —Hurd and Linsley, 1976. Smithsn. Contrib. Zool. 220: 5-16, 2 tables (flower preferences, territoriality of males, sleeping aggregations of males, nest sites, nest architecture, female aggressiveness at nest site, parasites, immature stages).

Morphology: Popov, 1941. Acad. Sci. USSR, Compt. Rend. 30: 82-85, 4 figs. (male genitalia). —Popov, 1945. Zool. Zhur. 24: 329-336, 3 figs. (male genitalia). —Rozen, 1951. Kans. Ent. Soc., Jour. 24: 142-150, 17 figs. (male genitalia).

## Genus PROTOXAEA Cockerell and Porter

*Protoxaea* Cockerell and Porter, 1899. Ann. and Mag. Nat. Hist. (7) 4: 410.

Type-species: *Megacilissa gloriosa* Fox. Monotypic and orig. desig.

This genus is composed of three species, two of which (*P. australis* Hurd and Linsley and *P. micheneri* Hurd and Linsley) occur in Mexico below the elevation of Mexico City and well to the south of *P. gloriosa* (Fox) which ranges over much of northern Mexico and adjacent southwestern United States.

Revision: Hurd and Linsley, 1976. *Smithsn. Contrib. Zool.* 220: 23-40, figs. 2-4, 17-40, map 1, plates 1-2 (included spp. with summary of biological literature).

Biology: Linsley and Michener, 1962. *Kans. Ent. Soc., Jour.* 35: 385-389 (habits).

**gloriosa** (Fox). Tex. west to Ariz.; Mexico (Baja California, Chihuahua, Coahuila, Durango, Nuevo Leon, Sinaloa, Sonora and Tamaulipas). Parasite: *Tripeolus* sp. Pollen: Narrowly polylectic, obtains pollen chiefly from the flowers of *Acacia angustissima*, *Cassia bauhinioides*, *C. leptocarpa*, *C. wislizenii*, *Desmanthus cooleyi*, *Kallstroemia grandiflora*, *Larrea tridentata*, *Prosopis glandulosa* var. *torreyanum*, *Solanum elaeagnifolium*, *S. rostratum*, but visits some of these and a wide variety of other flowers for nectar including *Aloysia gratissima*, *A. wrightii*, *Asclepias subverticillata*, *Baccharis glutinosa*, *Baileya multiradiata*, *Caesalpinia jamesii*, *Casuarina*, *Cevallia sinuata*, *Conyza coulteri*, *Croton pottsii*, *Dalea scoparia*, *Gaillardia pulchella*, *Gossypium*, *Guardiola tulocarpa*, *Helianthus annuus*, *Hoffmanseggia glauca*, *Koerberlinia spinosa*, *Lepidium lasiocarpum*, *L. montanum*, *Lygodesmia juncea*, *Medicago sativa*, *Melilotus alba*, *Menodora scabra*, *Mentzelia*, *Mimosa*, *Parkinsonia aculeata*, *Psilostrophe tagetina*, *Salvia azurea*, *Solidago occidentalis*, *Sphaeralcea*, *Tamarix gallica*, *T. ramosissima*, *Verbesina encelioides*.

*Megacilissa gloriosa* Fox, 1893. *Psyche* 6: 421. ♀.

*Oraea Tristis* Gribodo, 1894. *Soc. Ent. Ital., Bol.* 26: 278. ♂.

*Protoxaea gloriosa pallida* Cockerell, 1934. *Canad. Ent.* 66: 153. ♀, ♂.

Taxonomy: Rozen, 1964. *N. Y. Ent. Soc., Jour.* 72: 223-230, 7 figs. (larva and taxonomic significance, parasite). — Hurd and Linsley, 1976. *Smithsn. Contrib. Zool.* 220: 29-38, figs. 2, 3, 25-36, map 1, plates 1-3 (redescription, synonymy, geogr. and floral records).

Biology: Linsley and Michener, 1962. *Kans. Ent. Soc., Jour.* 35: 385-389 (habits). — Cazier and Linsley, 1963. *Canad. Ent.* 95: 547-556, 2 figs. (male territorial behavior). — Linsley and Cazier, 1963. *Pan-Pacific Ent.* 39: 1-18, 6 figs., 2 tables (floral relationships, diurnal activity). — Linsley and Cazier, 1972. *Amer. Mus. Novitates* 2509: 1-25, 4 tables (adult behavior). — Cazier and Linsley, 1974. *Amer. Mus. Novitates* 2546: 1-20, figs. 1-6, tables 1-2 (foraging behavior). — Hurd and Linsley, 1975. *Smithsn. Contrib. Zool.* 193: 27 (floral relationships, territorial behavior). — Cazier and Linsley, 1975. *Pan-Pacific Ent.* 51: 248-253, 6 figs., 2 tables (visitation to flowers of *Kallstroemia grandiflora* after two years drought). — Hurd and Linsley, 1976. *Smithsn. Contrib. Zool.* 220: 14-16 (adult behavioral characteristics).

### Genus MESOXAEA Hurd and Linsley

*Mesoxaea* Hurd and Linsley, 1976. *Smithsn. Contrib. Zool.* 220: 41.

Type-species: *Oraea nigerrima* Friese. Orig. desig.

As presently understood this genus contains seven species which occupy much of the Mexican mainland to the northeast, south, and west of the Mexican Plateau although one species inhabits the Valley of Mexico.

**arizonica** (Cockerell). South. Ariz.; Mexico (Nayarit, Sinaloa and Sonora). Pollen: Collects pollen of *Kallstroemia grandiflora*, but also visits other flowers for nectar including *Acacia angustissima*, *Buddleja sessiliflora*, *Tephrosia leiocarpa*, *Turnera diffusa*.  
*Protoxaea nigerrima arizonica* Cockerell, 1936. *Amer. Mus. Novitates* 831: 6. ♀.

Taxonomy: Hurd and Linsley, 1976. *Smithsn. Contrib. Zool.* 220: 61-64, figs. 61-64, map 3, table 2 (redescription, geogr. records and floral preferences).

**rufescens** Hurd and Linsley. South. Ariz.; Mexico (Nayarit, Sinaloa and Sonora). Pollen: Collects pollen from the flowers of *Mimosa polyantha*, *Solanum*, but visits other flowers for nectar including *Acacia angustissima*, *Buddleja sessiliflora*, *Croton culiacanensis*, *Kallstroemia grandiflora*, *Turnera diffusa*, *Verbesina encelioides*.

*Mesoxaea rufescens* Hurd and Linsley, 1976. *Smithsn. Contrib. Zool.* 220: 47, figs. 45-48, map 2, table 2. ♂, ♀.

**texana** (Friese). La., Tex.; Mexico (Nuevo Leon). Ecology: Nests in large aggregations in areas of sparse vegetation. Pollen: Collects pollen from flowers of *Solanum rostratum*, but

visits other flowers for nectar including *Aloysia gratissima*, *Croton*, *Eupatorium serotinum*, *Gossypium*, *Monarda punctata*, *Polygonum*, *Sesamum indicum*, *Verbena halei*, *Vernonia texana*.

*Oxaea texana* Friese, 1898. K. K. Naturhist. Hofmus., Ann. 13: 85. ♂.

Taxonomy: Cockerell, 1910. Ann. and Mag. Nat. Hist. (8) 6: 275. ♂, ♀. —Hurd and Linsley, 1976. Smithsn. Contrib. Zool. 220: 54-58, figs. 53-56, map 2, table 2 (redescription, geogr. and floral records).

Biology: Birkmann, 1932. Giddings News, 2 September 1932: 9, p. 7, columns 6 and 7 (habits).

—Cockerell, 1933. Amer. Nat. 67: 286-288 (nest site, habits). —Hurd and Linsley, 1976.

Smithsn. Contrib. Zool. 220: 57-58 (summary of literature).

## Family ANDRENIDAE

This is a large family of pollen-collecting bees which is present on all the continents except Australia. Nearly all of the species excavate their nests in the ground and most are solitary although a few species in each of the two subfamilies live in colonies. Their intrafloral relationships are varied and range from numerous examples of oligolecty in varying degrees to broad patterns of polylecty.

Even though both subfamilies are well represented in America north of Mexico by a great many species, the majority of our fauna consists of the chiefly Holarctic genus *Andrena* and the Nearctic genus *Perdita*.

Taxonomy: Rozen, 1951. Kans. Ent. Soc., Jour. 24: 142-150, 17 figs. (male genitalia).

—Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 86-330, figs. 1, 2, 4, 15-79, tables 3-9 (eastern U. S. spp.). —Yager and Rozen, 1966. Amer. Mus. Novitates 2265: 1-13, 18 figs. (pupae).

### SUBFAMILY ANDRENINAE

Taxonomy: Yager and Rozen, 1966. Amer. Mus. Novitates 2265: 5-6 (pupae).

### Genus ANDRENA Fabricius

Since studies of the relationships of the numerous subgenera within the genus *Andrena* are incomplete, the subgenera are arranged alphabetically in this catalog. Those species currently not assigned to any subgenus are placed after the recognized subgenera.

Taxonomy: Cockerell, 1898. N. Mex. Univ., Bul. 1: 48 (N. Mex. spp.) (reprint: Denison Univ.

Sci. Labs., Bul. 11: 48). —Cockerell, 1899. Ent. News. 10: 253 (misc.). —Cockerell, 1901.

Ent. News 12: 74 (misc.). —Cockerell, 1901. N. Y. Ent. Soc., Jour. 9: 132 (N. J. spp.).

—Robertson, 1902. Amer. Ent. Soc., Trans. 28: 187 (Ill. spp.). —Bruner, 1903. Amer. Ent.

Soc., Trans. 29: 240 (N. Amer. spp.). —Viereck, 1904. Canad. Ent. 36: 157, 189, 221 (Pacific

Northwest spp.). —Cockerell, 1906. Amer. Mus. Nat. Hist., Bul. 22: 429-437 (Colo. spp.).

—Viereck, 1907. Ent. News 18: 280 (Conn. spp.). —Cockerell, 1907. Colo. Univ., Studies 4:

244 (Colo. spp.). —Cockerell, 1914. Ann. and Mag. Nat. Hist. (8) 14: 10 (Colo. spp.).

—Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 1 (Rocky Mts. spp.). —Viereck,

1917 (1916). Conn. State Geol. and Nat. Hist. Survey, Bul. 22: 709-720 (Conn. spp.).

—Viereck, 1924. Canad. Ent. 56: 20 (subgenera). —Cockerell, 1930. Pan-Pacific Ent. 7: 7

(misc.). —Cockerell, 1931. Amer. Mus. Novitates 458: 1-20 (Rocky Mts. spp.). —Cockerell,

1932. Canad. Ent. 64: 155-158 (*Micrandrena*). —Cockerell, 1932. Pan-Pacific Ent. 8:

173-177 (misc. Calif. spp.). —Cockerell, 1932. Canad. Ent. 64: 285-288 (*sladeni* group).

—Atwood, 1934. Canad. Jour. Res. 10 (2): 206-214, figs. 31-91 (Nova Scotia spp.).

—Cockerell, 1937. Amer. Mus. Novitates 948: 15 (*Diandrena*, pars). —Linsley, 1938. Calif.

Acad. Sci., Proc. (4) 23: 263-282 (black spp.). —Lanham, 1941. Ent. Soc. Amer., Ann. 34:

702-713 (Colo. spp.). —Lanham, 1949. Pan-Pacific Ent. 25: 33-35 (females of *carlini* group).

—Lanham, 1949. Calif. Univ. Pubs. Ent. 8: 183-238 (subgenera). —Timberlake, 1951. U. S.

Natl. Mus., Proc. 101: 373-414 (misc. Calif. spp.). —Linsley and MacSwain, 1955.

Pan-Pacific Ent. 31: 163-172 (N. Amer. spp. of *Melandrena*). —Linsley and MacSwain,

1956. Pan-Pacific Ent. 32: 111-121 (*Oenothera* visiting spp.). —Mitchell, 1960. N. C. Agr.



Expt. Sta. Tech. Bul. 141: 86-257, figs. 2, 4, 6-57, tables 3-7 (eastern U. S. spp.). — Linsley and MacSwain, 1961. Pan-Pacific Ent. 37: 31-41 (*Diandrena* spp. associated with flowers of *Oenothera*). — Linsley and MacSwain, 1961. Pan-Pacific Ent. 37: 117-130 (*Onagrarendra* spp. associated with the flowers of *Clarkia* and *Oenothera*). — Linsley and MacSwain, 1962. Pan-Pacific Ent. 38: 49-52 (N. spp. of *Onagrarendra*). — Linsley and MacSwain, 1963. Pan-Pacific Ent. 39: 189-198 (N. spp. of *Onagrarendra*). — Knerer and Atwood, 1964. Ent. Soc. Ontario, Proc. 94: 41-56 (Ontario spp.). — LaBerge, 1964. Nebr. Univ. State Mus., Bul. 4: 279-316 (N. Amer. subgenera). — Ribble, 1967. Nebr. Univ. State Mus., Bul. 6: 27-42, figs. 1-5, 1 table, 1 map (subg. *Larandrena*). — LaBerge, 1967. Nebr. Univ. State Mus., Bul. 7: 1-316, 340 figs., 4 tables, 14 maps (subg. *Callandrena*). — Warneke, 1968. Coimbra Univ. Est. Mus. Zool., Mem. 307: 1-110 (west. Palaearctic subgenera). — Ribble, 1968. Kans. Ent. Soc., Jour. 41: 220-236, 15 figs., 1 map, 1 table (subg. *Belandrena*). — Ribble, 1968. Nebr. Univ. State Mus., Bul. 8: 237-394, 124 figs., 18 maps (subgenera *Derandrena* and *Micrandrena*). — Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 1-46, 88 figs., 5 tables, 13 maps (subg. *Diandrena*). — LaBerge, 1969. Amer. Ent. Soc., Trans. 95: 1-47, 38 figs., 3 tables (subgenera *Aporandrena*, *Charitandrena*, *Plastandrena*). — LaBerge and Bouseman, 1970. Amer. Ent. Soc., Trans. 96: 543-605, 75 figs., 5 maps (subg. *Tylandrena*). — Warneke, 1970. Bayerischen Ent. Nachr. 19: 28-32 (lectotypic designations). — LaBerge, 1971. Pan-Pacific Ent. 47: 47-57, 15 figs. (subg. *Nemandrena*). — LaBerge, 1971. Amer. Ent. Soc., Trans. 97: 441-520, 68 figs., 1 table (subgenera *Rhaphandrena*, *Scapteropsis*, *Xiphandrena*). — LaBerge and Ribble, 1972. Amer. Ent. Soc., Trans. 98: 27-358, 76 figs. (subgenera *Geissandrena*, *Gonandrena*, *Parandrena*, *Pelicandrena*). — LaBerge, 1973. Amer. Ent. Soc., Trans. 99: 235-371, 69 figs., 2 tables, 15 maps (subg. *Trachandrena*). — Ribble, 1974. Amer. Ent. Soc., Trans. 100: 101-189, 99 figs., 5 tables (subg. *Scaphandrena*). — LaBerge and Ribble, 1975. Amer. Ent. Soc., Trans. 101: 371-446, 74 figs. (subg. *Euandrena*). — Donovan, 1977. Calif. Univ. Pubs. Ent. 81: 1-107, 130 figs., 17 maps (subg. *Cnemidandrena*; received too late for inclusion in this catalog). — LaBerge, 1977. Amer. Ent. Soc., Trans. 103: 1-143, 128 figs., 3 tables (subgenera *Dasyandrena*, *Euandrena*, *Oxyandrena*, *Psammandrena*, *Rhacandrena*, *Thysandrena*; received too late for inclusion in this catalog).

Biology: Graenicher, 1905. Wis. Acad. Sci., Arts and Letters 15: 89-97 (floral relationships). — Linsley, 1937. Brooklyn Ent. Soc., Bul. 32: 125-127 (occurrence of double broods in N. Amer. spp.). — Linsley, MacSwain and Smith, 1955. Pan-Pacific Ent. 31: 173-185 (floral relationships of *Melandrena*). — Linsley and MacSwain, 1959. Calif. Univ. Pubs. Ent. 16: 1-46, 9 plates, 6 textfigs. (*Ranunculus* visiting spp.). — Linsley, MacSwain and Raven, 1963. Calif. Univ. Pubs. Ent. 33: 1-58, 6 plates, 6 textfigs. (comparative behavior of spp. visiting flowers of Onagraceae in the Colorado Desert and Great Basin). — Linsley, MacSwain and Raven, 1964. Calif. Univ. Pubs. Ent. 33: 59-98, 3 plates, 17 tables (comparative behavior of spp. visiting flowers of Onagraceae in the Mojave Desert). — Stephen, 1966. Kans. Ent. Soc., Jour. 39: 42-50, 2 figs. (comparative bionomics). — Youssef and Bohart, 1968. Kans. Ent. Soc., Jour. 41: 442-444 (literature references to nesting habits). — Cruden, 1972. Madrono 21: 505-515, 1 fig., 2 tables (*Nemophila* visiting spp.). — Cruden, 1972. Evolution 26: 373-389, 8 figs., 9 tables (oligolectic spp. of *Nemophila menziesii*, evolution of oligolectic bees). — MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 70: 1-80, 3 plates, 10 textfigs., 18 tables (comparative behavior of *Clarkia* visiting spp.). — Linsley, MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 71: 1-68, 6 plates, 15 textfigs., 10 tables (comparative behavior of *Camissonia* and *Oenothera* visiting spp.). — Davis and LaBerge, 1975. Ill. Nat. Hist. Survey, Biol. Notes 95: 2 (literature references to nesting habits).

#### Genus ANDRENA Subgenus ANDRENA Fabricius

*Andrena* Fabricius, 1775. Systema Ent., p. 376.

Type-species: *Apis helvola* Linnaeus. Desig. by Viereck, 1912.

*Anthrena* Illiger, 1801. Mag. Insektenk. 1: 127. Emend.

*Anthochaeressa* Gistel, 1850. Isis (Encycl. Ztschr.) 6: 82.

Type-species: *Apis helvola* Linnaeus. Autobasic; proposed unnecessarily for *Andrena* Fabricius which Gistel considered to be preoccupied by *Anthrenus* Geoffroy, 1764.

- Taxonomy: Lanham, 1949. Calif. Univ. Pubs. Ent. 8: 205 (tax. characters). — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 104-110, figs. 15-16, 20-22, table 3 (eastern U. S. spp.). — Lanham, 1965. Kans. Ent. Soc., Jour. 38: 198-201 (*Salix* visiting spp. of the Colorado Front Range).
- advarians** Viereck. B. C.  
*Andrena advarians* Viereck, 1904. Canad. Ent. 36: 192, 224. ♀, ♂.
- albihirta** (Ashmead). Rocky Mts. and Pacific Coast. Pollen: Collects pollen from *Salix*, including *S. laevigata*, *S. lasiolepis*.  
*Cilissa albihirta* Ashmead, 1890. Colo. Biol. Assoc., Bul. 1: 5. ♀.  
*Andrena bebbiana* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 39. ♀.
- Taxonomy: Cockerell, 1931. Amer. Mus. Novitates 458: 8 (tax. characters). — Lanham, 1941. Ent. Soc. Amer. Ann. 34: 705, 708. (tax characters, as *bebbiana*) female, male (key). — Lanham, 1965. Kans. Ent. Soc., Jour. 38: 199-200 (tax. status, synonymy).
- Biology: Lanham, 1974. Kans. Ent. Soc., Jour. 47: 373-377, 1 fig., 1 table (effect of melanism on adult behavior, floral relationships, stylopization).
- albosellata** Cockerell. Wyo., Colo. Predator: *Philanthus crabroniformis* Sm.  
*Andrena albosellata* Cockerell, 1931. Amer. Mus. Novitates 458: 7. ♀.
- asmi** Viereck. Wash.  
*Andrena asmi* Viereck, 1904. Canad. Ent. 36: 192, 225. ♀, ♂.
- banffensis** Viereck. Alta.  
*Andrena (Andrena) banffensis* Viereck, 1924. Canad. Ent. 56: 32. ♀.
- bella** Viereck. B. C.  
*Andrena (Andrena) bella* Viereck, 1924. Canad. Ent. 56: 22. ♀.
- birtwelli** Cockerell. N. Mex., Colo., Calif. Pollen: Unknown, but visits flowers of *Antennaria*, *Eriogonum*, *Potentilla*, *Solidago*.  
*Andrena birtwelli* Cockerell, 1901. Psyche 9: 283. ♀.  
*Andrena birtwelli subatrata* Cockerell, 1931. Amer. Mus. Novitates 458: 8. ♀.
- Taxonomy: Viereck, 1903. Amer. Ent. Soc., Trans. 29: 54. ♂. — Lanham, 1941. Ent. Soc. Amer., Ann. 34: 705. ♀ (key).
- buckelli** Viereck. B. C.  
*Andrena (Andrena) buckelli* Viereck, 1924. Canad. Ent. 56: 22. ♀, ♂.
- carrikeri** Viereck and Cockerell. Nebr.  
*Andrena carrikeri* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 14. ♂.
- ceanothifloris** Linsley. South. Calif. Pollen: Possibly an oligolege of *Ceanothus* including *C. cordulatus*, *C. integerrimus*, *C. leucodermis*, but visits other flowers including *Arctostaphylos patula*, *Eriodictyon californicum*, *Horkelia*, *Ribes*.  
*Andrena ceanothifloris* Linsley, 1938. Calif. Acad. Sci., Proc. (4) 23: 270. ♀, ♂.
- clarkella** (Kirby). Holarctic; Alaska to Ont., Que., Mass. and Maine, south to Colo., Minn. and N. Y.; Europe. Pollen: Apparently an oligolege of *Salix*.  
*Melitta Clarkella* Kirby, 1802. Monog. Apum Angliae, v. 2, p. 130. ♀.
- Taxonomy: Sladen, 1919. Canad. Ent. 51: 124. ♀, ♂. — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 104-105, figs. 15-16, 21, table 3 (redescription). — Lanham, 1963. Pan-Pacific Ent. 40: 9 (geogr. records). — Lanham, 1965. Kans. Ent. Soc., Jour. 38: 199 (floral and geogr. records).
- clypeoporaria** Viereck. Wash., Oreg.  
*Andrena clypeoporaria* Viereck, 1904. Canad. Ent. 36: 192. ♀.
- cristata** Viereck. Nev.  
*Andrena (Andrena) cristata* Viereck, 1917. Acad. Nat. Sci. Phila., Proc. 68: 556. ♀.
- diversicolor** Viereck. Alta.  
*Andrena (Andrena) diversicolor* Viereck, 1924. Canad. Ent. 56: 76. ♀.
- edwardsi** Viereck. Idaho.  
*Andrena edwardsi* Viereck, 1916. Amer. Mus. Nat. Hist., Bul. 35: 731. ♀.
- edwiniae** Cockerell. Colo.  
*Andrena edwiniae* Cockerell, 1906. Ann. and Mag. Nat. Hist. (7) 17: 310. ♀.

- Biology: Clements and Long, 1923. Carnegie Inst. Wash., Pub. 326: 249 (ecology).
- enigmatica** Viereck and Cockerell. Nebr.  
*Andrena enigmatica* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 33. ♂.
- erecta** Viereck. B. C. to Calif. Pollen: Unknown, but visits flowers of *Chamaebatia foliolosa*, *Clarkia dudleyana*, *Erigeron glaucus*, *Paeonia browni*, *Phacelia imbricata*, *Rubus*, *Thysanocarpus curvipes*.  
*Andrena (Andrena) erecta* Viereck, 1924. Canad. Ent. 56: 28. ♀, ♂.
- excellens** Viereck. B. C.  
*Andrena (Andrena) excellens* Viereck, 1924. Canad. Ent. 56: 76. ♀.
- frigida** Smith. Alaska to N. S., south to Va., Ill., Wis., Minn., Wash. and Oreg. Pollen: Unknown, but visits flowers of *Cornus*, *Prunus*, *Salix discolor*.  
*Andrena frigida* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 115. ♀.  
*Andrena moesta* Smith, 1879. Desc. New Species Hym. Brit. Mus. p. 54. ♀, ♂.  
*Andrena cockerelli* Graenicher, 1903. Canad. Ent. 35: 163. ♀, ♂.  
*Andrena hirticeps* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 116. ♂. Preocc.  
*Andrena hirtignatha* Linsley, 1951. In Muesebeck, Krombein and Townes, U. S. Dept. Agr., Agr. Monog. 2: 1068. N. name.
- Taxonomy: Morice and Cockerell, 1901. Canad. Ent. 33: 149. ♀ (type). —Cockerell, 1906. Psyche 13: 33 (type). —Atwood, 1934. Canad. Jour. Res. 10: 207, 209. ♀, ♂ (key). —Morice and Cockerell, 1901. Canad. Ent. 33: 149 (type of *hirticeps*). —Morice and Cockerell, 1901. Canad. Ent. 33: 153 (type of *moesta*). —Cockerell, 1906. Psyche 13: 26 (type of *hirticeps*). —Cockerell, 1906. Psyche 13: 34 (type of *moesta*). —Viereck, 1907. Ent. News 18: 283, 285. ♀, ♂ (key, as *cockerelli*). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 105-106, figs. 15-16, table 3 (redescription, synonymy).
- fulvicrista** Viereck. B. C.  
*Andrena (Andrena) fulvicrista* Viereck, 1924. Canad. Ent. 56: 30. ♀, ♂.
- harveyi** Viereck. B. C., Oreg.  
*Andrena harveyi* Viereck, 1904. Canad. Ent. 36: 192, 194. ♀, ♂.
- hemileuca** Viereck. Wash.  
*Andrena hemileuca* Viereck, 1904. Canad. Ent. 36: 192, 193. ♀, ♂.
- hitei** Cockerell. Colo.  
*Andrena hitei* Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 19: 369. ♀.
- Taxonomy: Nelson, 1930. Ent. News 41: 322, fig. ♀, ♂. —Lanham, 1941. Ent. Soc. Amer., Ann. 34: 705. ♀ (key).
- impuncta** Kirby. Maine, N. Y.  
*Andrena impuncta* Kirby, 1837. Faun. Bor.-Amer., v. 4, p. 268. ♀.
- irana** Cockerell. Colo. Parasite: *Nomada morrisoni* Cress., *N. vallesina* Ckll?  
*Andrena irana* Cockerell, 1931. Ann. and Mag. Nat. Hist. (10) 3: 392. ♀.
- Taxonomy: Linsley, 1938. Calif. Acad. Sci., Proc. (4) 23: 265. ♀ (key). —Lanham 1941. Ent. Soc. Amer., Ann. 34: 705. ♀ (key).
- Biology: Hicks, 1934. Colo. Univ., Studies 21: 267 (nest, parasite).
- laminibucca** Viereck and Cockerell. Colo.  
*Andrena laminibucca* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 37. ♂.
- lewisi** Cockerell. Colo. Pollen: Unknown, but visits flowers of *Rubus*.  
*Andrena lewisi* Cockerell, 1906. Amer. Mus. Nat. Hist., Bul. 22: 435. ♀.
- Taxonomy: Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 57. ♀ (var.). —Cockerell, 1927. Ent. Soc. Amer., Ann. 20: 397. ♀.
- Biology: Clements and Long, 1923. Carnegie Inst. Wash., Pub. 336: 249 (ecology).
- lillooetensis** Viereck. B. C.  
*Andrena (Andrena) lillooetensis* Viereck, 1924. Canad. Ent. 56: 237. ♂.
- lummiorum** Viereck. B. C.  
*Andrena (Andrena) lummiorum* Viereck, 1916. Acad. Nat. Sci. Phila., Proc. 68: 564. ♀.

- macoupinensis* Robertson. Ill., Mass., N. C. Pollen: Unknown, but visits flowers of *Prunus*, *Salix*, *Vicia*.  
*Andrena macoupinensis* Robertson, 1900. Acad. Sci. St. Louis, Trans. 10: 48. ♀.
- Taxonomy: Robertson, 1902. Amer. Ent. Soc., Trans. 28: 191. ♀ (key). — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 141: 106, figs. 15-16, 21, table 3 (redescription).
- magnifica** Viereck. B. C.  
*Andrena (Andrena) magnifica* Viereck, 1924. Canad. Ent. 56: 77. ♀.
- mandibularis** Robertson. N. S. and Ont., south to Ga., west to Ill. and Minn. Pollen: Unknown, but visits flowers of *Amelanchier*, *Claytonia*, *Cornus*, *Crataegus*, *Hepatica*, *Kalmia*, *Malus*, *Prunus*, *Pyrus*, *Rhamnus*, *Rhus*, *Salix*, *Staphylea*, *Uvularia*, *Viburnum*, *Zanthoxylum*.  
*Andrena mandibularis* Robertson, 1892. Amer. Nat. 26: 272. ♂.
- Taxonomy: Robertson, 1902. Amer. Ent. Soc., Trans. 28: 191, 192. ♀, ♂ (key). — Atwood, 1934. Canad. Jour. Res. 10: 209. ♂ (key). — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 106-107, figs. 15, 22, table 3 (redescription).
- Biology: Salt, 1927. Jour. Expt. Zool. 48: 252 (stylopization).
- mesoleuca** Cockerell. Calif.  
*Andrena mesoleuca* Cockerell, 1924. Pan-Pacific Ent. 1: 60. ♀.
- metea** Cockerell. Wyo.  
*Andrena metea* Cockerell, 1924. Ent. News 35: 350. ♂.
- milwaukeeensis** Graenicher. N. S. to Ga., west to Minn. Pollen: Unknown, but visits flowers of *Aruncus*, *Cornus*, *Ilex*, *Pyrus malus*, *Rubus*, *Viburnum*.  
*Andrena milwaukeeensis* Graenicher, 1903. Canad. Ent. 35: 164. ♀, ♂.
- Taxonomy: Viereck, 1907. Ent. News 18: 283, 285. ♀, ♂ (key). — Atwood, 1934. Canad. Jour. Res. 10: 207, 209. ♀, ♂ (key). — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 107-108, figs. 15-16, 20, table 3 (redescription).
- Biology: Brittain, 1933. Canad. Dept. Agr., Bul. 162: 94, figs. (ecology).
- moesticolor** Viereck and Cockerell. Colo.  
*Andrena moesticolor* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 43: 31. ♀, ♂.
- monogonoparia** Viereck. Nev.  
*Andrena (Andrena) monogonoparia* Viereck, 1917. Acad. Nat. Sci. Phila., Proc. 68: 566. ♂.
- nitidarum** Viereck. Alta.  
*Andrena (Andrena) nitidarum* Viereck, 1924. Canad. Ent. 56: 78. ♀.
- nodosa** Viereck. Alta.  
*Andrena (Andrena) nodosa* Viereck, 1924. Canad. Ent. 56: 238. ♀.
- paenefulva** Viereck and Cockerell. Colo.  
*Andrena paenefulva* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 51. ♀.
- pallida** Viereck. Alta.  
*Andrena (Andrena) pallida* Viereck, 1924. Canad. Ent. 56: 78. ♀.
- palpalis** Timberlake. South. Calif. Pollen: Unknown, but visits flowers of *Calandrinia menziesii*, *Cryptantha barbigera*, *Larrea tridentata*, *Phacelia affinis*, *P. distans*, *Salix goodingii*.  
*Andrena (Andrena) palpalis* Timberlake, 1951. U. S. Natl. Mus., Proc. 101: 400. ♀, ♂.
- perarmata** Cockerell. B. C. to Calif. Pollen: Oligolege of *Salix* including *S. lasiolepis*, but visits other flowers for nectar including *Baccharis*.  
*Andrena perarmata* Cockerell, 1898. Entomologist 31: 88. ♂.
- Taxonomy: Cockerell, 1911. Ann. and Mag. Nat. Hist. (8) 7: 232. ♂. — Lanham, 1941. Ent. Soc. Amer., Ann. 34: 705, 708. ♀, ♂ (key). — Lanham, 1965. Kans. Ent. Soc., Jour. 38: 199-200 (tax. status, geogr. range).
- pyrrhacita mosina** Cockerell. Colo. Pollen: Oligolege of *Salix*.  
*Andrena pyrrhacita* var. *mosina* Cockerell, 1908. Ann. and Mag. Nat. Hist. (8) 2: 330. ♀.
- Taxonomy: Lanham, 1965. Kans. Ent. Soc., Jour. 38: 201 (tax. status).

**pyrrhacita pyrrhacita** Cockerell. B. C. to Colo., Utah, Calif. Pollen: Oligolege of *Salix*.

*Andrena pyrrhacita* Cockerell, 1917. Ann. and Mag. Nat. Hist. (7) 19: 536. ♀.

*Andrena pyrrhacita* var. *coloradensis* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 39. ♀.

Taxonomy: Lanham, 1965. Kans. Ent. Soc., Jour. 38: 200-201 (tax. status).

**revelstokensis** Viereck. B. C.

*Andrena (Andrena) revelstokensis* Viereck, 1924. Canad. Ent. 56: 239. ♀.

**rhodotricha** Linsley. Calif.

*Andrena rhodotricha* Linsley, 1939. Pan-Pacific Ent. 15: 157. ♀, ♂.

Taxonomy: MacSwain, 1945. Pan-Pacific Ent. 21: 134 (nesting habits).

**ribesina** Cockerell. Colo. Pollen: Unknown, but visits flowers of *Ribes*.

*Andrena ribesina* Cockerell, 1906. Amer. Mus. Nat. Hist., Bul. 22: 433. ♀.

*Andrena jacobaea* Cockerell, 1915. Ann. and Mag. Nat. Hist. (8) 15: 267. ♀.

Taxonomy: Linsley, 1951. In Muesebeck, Krombein and Townes, U. S. Dept. Agr., Agr. Monog. 2: 1079 (synonymy).

**ribifloris** Viereck and Cockerell. Colo. Pollen: Unknown, but visits flowers of *Ribes*.

*Andrena ribifloris* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 32. ♂ (♀ misdet.).

**saccata** Viereck. Wash. to Calif. Pollen: Unknown, but visits flowers of *Eriogonum*.

*Andrena saccata* Viereck, 1904. Canad. Ent. 36: 192, 195. ♀, ♂.

Taxonomy: Cockerell, 1937. Amer. Mus. Novitates 899: 3 (tax. characters).

**salicicola** Viereck and Cockerell. Colo. Pollen: Unknown, but visits flowers of *Salix*.

*Andrena salicicola* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 52. ♀.

**semifulva** Viereck. Calif.

*Andrena (Andrena) semifulva* Viereck, 1916. Acad. Nat. Sci. Phila., Proc. 68: 575. ♀.

**singularis** Viereck. B. C.

*Andrena (Andrena) singularis* Viereck, 1924. Canad. Ent. 56: 80. ♀.

**thaspia** Graenicher. N. S. to N. J. west to Ind., Wis. and Minn. Pollen: Unknown, but visits flowers of *Angelica atropurpurea*, *Brassica*, *Chrysanthemum*, *Diervilla*, *Ledum*, *Pyrus malus*, *Raphanus*, *Rosa*, *Rubus*, *Solidago*, *Stellaria*, *Taraxacum*, *Thaspium trifoliatum aureum*, *Trifolium*, *Vaccinium*.

*Andrena thaspia* Graenicher, 1903. Canad. Ent. 35: 162. ♀, ♂.

Taxonomy: Cockerell, 1912. Ann. and Mag. Nat. Hist. (8) 9: 382. ♀ (var.). —Atwood, 1934. Canad. Jour. Res. 10: 208, 209. ♀, ♂ (key). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 108-109, table 3 (redescription).

**thaspiiformis** Viereck. Calif. Pollen: Oligolege of *Salix* including *S. gooddingii*, *S. hindsiana*, *S. laevigata*, *S. lasiolepis*, *S. nigra*, but visits other flowers presumably for nectar including *Sambucus caerulea*, *Spiraea prunifolia*.

*Andrena (Andrena) perezana thaspiiformis* Viereck, 1917. Amer. Ent. Soc., Trans. 43: 386. ♀.

**tincta** Viereck. Colo.

*Andrena (Andrena) tincta* Viereck, 1917. Amer. Ent. Soc., Trans. 43: 387. ♀.

**topazana** Cockerell. Colo., Idaho, Wyo.

*Andrena topazana* Cockerell, 1906. Amer. Mus. Nat. Hist., Bul. 22: 434. ♀.

Taxonomy: Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 44, 45. ♀. —Cockerell, 1927. Ent. Soc. Amer., Ann. 20: 397. ♀.

**tridens** Robertson. New England States, south to Tenn. and Ga., west to Mich. and Ill. Pollen: Unknown, but visits flowers of *Azalea*, *Dentaria*, *Hepatica*, *Hydrangea*, *Rhododendron*, *Rhus*.

*Andrena tridens* Robertson, 1902. Amer. Ent. Soc., Trans. 28: 192. ♂.

*Andrena cornelli* Viereck, 1907. Ent. News 18: 282. ♀.

Taxonomy: Mitchell, 1958. In Krombein, U. S. Dept. Agr., Agr. Monog. 2, First Suppl. pp. 213, 216 (synonymy). — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 109-110, figs. 15-16, 20-21, table 3 (redescription).

**washingtoni** Cockerell, B. C. to Wash. and Colo.

*Andrena washingtoni* Cockerell, 1901. Psyche 9: 284. ♀, ♂.

Taxonomy: Viereck, 1904. Canad. Ent. 36: 192, 195. ♀, ♂ (key).

Biology: Clements and Long, 1923. Carnegie Inst. Wash., Pub. 336: 249 (ecology).

### Genus ANDRENA Subgenus APORANDRENA Lanham

*Andrena* subg. *Aporandrena* Lanham, 1949. Calif. Univ. Pubs. Ent. 8: 201.

Type-species: *Andrena coactipostica* Viereck. Monotypic and orig. desig.

Revision: LaBerge, 1969. Amer. Ent. Soc., Trans. 95: 34-40, figs. 29-33 (N. Amer. spp.).

**coactipostica** Viereck. Calif. Pollen: Polylectic, apparently prefers flowers of the families Papaveraceae and Boraginaceae in that order, but visits a variety of flowers including *Calandrinia menziesii*, *Capsella bursa-pastoris*, *Cryptantha intermedia*, *Encelia farinosa*, *Eschscholzia californica*, *Lasthenia gracilis*, *Phacelia distans*, *Plagiobothrys californicus*, *P. nothofulvus*, *Platystemon californicus*.

*Andrena* (*Andrena*) *coactipostica* Viereck, 1917. Amer. Ent. Soc., Trans. 43: 372. ♀.

### Genus ANDRENA Subgenus BELANDRENA Ribble

*Andrena* subg. *Belandrena* Ribble, 1968. Kans. Ent. Soc., Jour. 41: 221.

Type-species: *Andrena nemophilae* Ribble. Orig. desig.

The species of this subgenus exhibit a strong preference for the flowers of the families Hydrophyllaceae and Malvaceae.

Revision: Ribble, 1968. Kans. Ent. Soc., Jour. 41: 220-236, 15 figs., 1 map, 1 table (N. Amer. spp.).

Biology: Cruden, 1972. Madrono 21: 505-515, 1 fig., 2 tables (floral relationships). — Cruden, 1972. Evolution 26: 373-389, 8 figs., 9 tables (floral relationships).

**nemophilae** Ribble. Calif. Parasite: *Caloglyphus* sp., *Meloe* sp. Pollen: Oligolectic on flowers of *Nemophila* including *N. maculata*, *N. menziesii* atomeria, *N. m. integrifolia*, *N. m. menziesii*, *N. pulchella*, but visits other flowers for nectar including *Arctostaphylos*, *Ceanothus*, *Gilia*, *Montia*, *Pholistoma auritum*.

*Andrena* (*Belandrena*) *nemophilae* Ribble, 1968. Kans. Ent. Soc., Jour. 41: 223, figs. 1-5, map 1, table 1. ♀, ♂.

**sagittagalea** Ribble. Tex. Parasite: *Vidia* sp. Pollen: Apparently oligolectic on flowers of *Phacelia*, but also visits flowers of *Salix*.

*Andrena* (*Belandrena*) *sagittagalea* Ribble, 1968. Kans. Ent. Soc., Jour. 41: 230, figs. 6-10, map 1, table 1. ♀, ♂.

**sphaeralceae** Linsley. Ariz. west to south. Calif. and south. Nev. Pollen: Apparently oligolectic on flowers of *Sphaeralcea* including *S. ambigua*, *S. laxa*, *S. orcutti*, *S. subhastata*, but visits other flowers presumably for nectar including *Koeberlinia*, *Phacelia distans*.

*Andrena* (*Opandrena*) *sphaeralceae* Linsley, 1939. Pan-Pacific Ent. 15: 160. ♀, ♂.

### Genus ANDRENA Subgenus CALLANDRENA Cockerell

*Callandrena* Cockerell, 1898. Amer. Ent. Soc., Trans. 25: 186.

Type-species: *Panurgus manifestus* Fox. Monotypic.

*Pterandrena* Robertson, 1902. Amer. Ent. Soc., Trans. 28: 193.

Type-species: *Andrena pulchella* Robertson. Orig. desig.

Most species of this subgenus obtain pollen from the flowers of the Compositae.

Revision: LaBerge, 1967. Nebr. Univ. State Mus., Bul. 7: 1-316, 340 figs., 4 tables, 14 maps (N. Amer. spp.).

- Taxonomy: Lanham, 1949. Calif. Univ. Pubs. Ent. 8: 198 (tax. characters). — LaBerge, 1964. Nebr. Univ. State Mus., Bul. 4: 294 (tax. characters).
- accepta** Viereck. N. J. to S. C., west to Alta, Oreg., east. Calif. (Big Pine), and Ariz.; Mexico (Chihuahua). Parasite: *Myopa?* or *Zodion obliquefasciatum* (Macq.). Pollen: Oligolege of Compositae, especially *Helianthus* including *H. angustifolius*, *H. annuus*, *H. divaricatus*, *H. giganteus*, *H. grosseserratus*, *H. maximilliani*, *H. petiolaris*, *H. salicifolius*, *H. scaberimus*, *H. strumosus*, *H. tuberosus*, but visits other flowers including *Aster ericoides villosus*, *Bidens aristosa*, *Cassia chamaecrista*, *Chrysothamnus*, *Coreopsis tripteris*, *Gaillardia pulchella*, *Grindelia squarrosa*, *Gutierrezia sarothrae*, *Haplopappus*, *Machaeranthera*, *Medicago sativa*, *Prionopsis ciliata*, *Silphium integrifolium*, *S. perfoliatum*, *S. speciosum*, *Solidago nemoralis*, *Verbesina occidentalis*, *V. oreophila*.
- Andrena pulchella* Robertson, 1891. Amer. Ent. Soc., Trans. 18: 57. ♀. Preocc.
- Andrena accepta* Viereck, 1916. Biol. Soc. Wash., Proc. 29: 127. N. name.
- Taxonomy: Robertson, 1902. Amer. Ent. Soc., Trans. 28: 193, 194. ♀, ♂ (key). — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 137-138, figs. 24-26, 28, table 4 (redescription). — Rozen, 1973. N. Y. Ent. Soc., Jour. 81: 58-61, figs. 3-10 (mature larva).
- Biology: Rozen, 1973. N. Y. Ent. Soc., Jour. 81: 54-58, 2 figs. (nest architecture, life history, parasite).
- afimbriata** LaBerge. Tex. Pollen: Unknown, but visits flowers of *Berlandiera*, *Polygala alba*, *Pyrropappus carolinianus*.
- Andrena (Callandrena) afimbriata* LaBerge, 1967. Nebr. Univ. State Mus., Bul. 7: 165, figs. 169-172. ♀, ♂.
- aliciae** Robertson. N. Y. to Ga., west to Minn. Nebr. and Kans. Pollen: Oligolege of Compositae, especially *Helianthus* including *H. angustifolius*, *H. divaricatus*, *H. giganteus*, *H. microcephalus*, *H. strumosus*, *H. tuberosus*, but visits other flowers including *Aster azurella*, *Bidens aristosa*, *B. chrysanthemoides*, *B. laevis*, *B. trichosperma*, *Cucurbita*, *Heliopsis helianthoides*, *Rudbeckia fulgida*, *R. laciniata*, *R. lanceolata*, *R. triloba*, *Silphium perfoliatum*, *Solidago occidentale*.
- Andrena aliciae* Robertson, 1891. Amer. Ent. Soc., Trans. 18: 57. ♀, ♂.
- Taxonomy: Robertson, 1902. Amer. Ent. Soc., Trans. 28: 193. ♀, ♂ (key). — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 138-139, figs. 24-25, table 4 (redescription).
- aliciarum** Cockerell. N. Mex., Ariz.; Mexico (Sonora). Pollen: Unknown, but visits flowers of *Eriogonum*, *Pectis papposa*.
- Andrena aliciarum* Cockerell, 1897. Entomologist 30: 138. ♀.
- Taxonomy: Cockerell, 1899. Ent. News 10: 254. ♂.
- aridis** LaBerge. Colo., Nebr., N. Mex., Tex. Pollen: Unknown, but visits flowers of *Chrysothamnus nauseosus*, *Gutierrezia microcephala*, *G. sarothrae*.
- Andrena (Callandrena) aridis* LaBerge, 1967. Nebr. Univ. State Mus., Bul. 7: 249, figs. 277-281. ♀, ♂.
- asteris** Robertson. Que. to Ga., west to Man, N. Dak., Nebr., and Mo. Pollen: Oligolege of Compositae, especially flowers of *Aster* including *A. ericoides*, *A. paniculatus*, but visits other flowers including *Echinacea*, *Eupatorium altissimum*, *Polygonum pennsylvanicum*, *Solidago nemoralis*, *S. puberula*, *S. rigida*, *S. ulmifolia*. Predator: *Philanthus solivagus* Say.
- Andrena asteris* Robertson, 1891. Amer. Ent. Soc., Trans. 18: 56. ♀, ♂.
- Taxonomy: Robertson, 1902. Amer. Ent. Soc., Trans. 28: 194. ♀, ♂ (key). — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 139-140, figs. 24-26, 28, table 4 (redescription).
- Biology: Salt, 1927. Expt. Zool., Jour. 48: 251 (stylopization). — Britton, 1937. Conn. (State) Agr. Expt. Sta., Bul. 408: 261 (economic).
- asteroides** Mitchell. N. J. and Pa., south to S. C. and Miss. Pollen: Apparently an oligolege of *Aster* including *A. ericoides*, *A. dumosus*, *A. paniculatus*, but visits other flowers including *Chrysopsis*, *Haplopappus*.
- Andrena (Pterandrena) asteroides* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 140, figs. 24, 25. ♀, ♂.

**auripes** LaBerge. Ariz. (Graham Mts.); Mexico (Distrito Federal and Mexico).

*Andrena (Callandrena) auripes* LaBerge, 1967. Nebr. Univ. State Mus., Bul. 7: 204, figs. 219-223. ♀, ♂.

**balsamorhizae** LaBerge. Nev. (Lake Mead, Overton Beach and Rodgers Springs). Pollen: Unknown, but visits flowers of *Balsamorhiza*.

*Andrena (Callandrena) balsamorhizae* LaBerge, 1967. Nebr. Univ. State Mus., Bul. 7: 252, figs. 282-286. ♀, ♂.

**barberi** Cockerell. N. Mex. (Eagle Creek and Ruidoso Forks, White Mts.); Mexico (Durango, Guadalupe, Guanajuato, Hidalgo, Mexico, Puebla, Tlaxcala and Vera Cruz). Pollen:

Apparently an oligolege of Compositae, including *Bidens triplinervia* var. *macrantha*, *Heterotheca*, *Rudbeckia laciniata*, *Solidago trinervata*, but visits other flowers including *Argemone*, *Prunus*.

*Andrena barberi* Cockerell, 1898. Ann. and Mag. Nat. Hist. (7) 2: 448. ♀, ♂.

Taxonomy: Cockerell, 1931. Amer. Mus. Novitates 458: 14. ♀ (key).

**beameri** LaBerge. Ark., Kans. Pollen: Unknown, but visits flowers of *Coreopsis grandiflora*, *Echinacea angustifolia*, *Helianthemum nudiflora*.

*Andrena (Callandrena) beameri* LaBerge, 1967. Nebr. Univ. State Mus., Bul. 7: 135. ♀.

**berkeleyi** Viereck and Cockerell. Colo., Okla., Tex. Pollen: Unknown, but visits flowers of *Actinea*, *Engelmannia pinnatifida*.

*Andrena berkeleyi* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 19. ♂.

Taxonomy: Cockerell, 1933. Pan-Pacific Ent. 9: 153. ♂.

**biscutellata** Viereck. Colo., Kans., N. Mex., Tex. Pollen: Unknown, but visits flowers of *Gaillardia*, *Monarda*.

*Andrena (Ptilandrena) biscutellata* Viereck, 1917. Amer. Ent. Soc., Trans. 43: 393. ♀.

**braccata** Viereck. New England States to Va. Pollen: Apparently an oligolege of *Solidago* including *S. altissima*, *S. nemoralis*, but also visits flowers of *Aster*.

*Andrena braccata* Viereck, 1907. Ent. News 18: 284, 286. ♀, ♂.

Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 141-142, figs. 24-25, table 4 (redescription).

Biology: Clements and Long, 1923. Carnegie Inst. Wash., Pub. 336: 249 (ecology).

**bullata** LaBerge. Tex. (Brazos and Lee Counties). Pollen: Unknown, but visits flowers of *Gutierrezia texana*, *Heterotheca subarillaris*.

*Andrena (Callandrena) bullata* LaBerge, 1967. Nebr. Univ. State Mus., Bul. 7: 154, figs. 154-158. ♀, ♂.

**calvata** LaBerge. Ariz. (22 miles west of Springerville). Pollen: Unknown, but visits flowers of *Viguiera annua*.

*Andrena (Callandrena) calvata* LaBerge, 1967. Nebr. Univ. State Mus., Bul. 7: 74, figs. 60-64. ♂.

**crawfordi** Viereck. Kans., Okla., Tex. Pollen: Oligolege of Compositae, tribe Cichorieae, visits flowers of *Berlandiera*, *Coreopsis*, *Engelmannia bipinnatifida*, *Lindheimeria texana*, *Polygala alba*, *Pyrrhopyrum carolinianum*, *P. geiseri*, *P. grandiflora*, *P. multicaulis*, *Serinea oppositifolia*, *Sitilias*.

*Andrena crawfordi* Viereck, 1909. Ent. Soc. Wash., Proc. 11: 143. ♀, ♂.

**duplicata** Mitchell. N. J., N. C., Ohio, Ill., Mo. Pollen: Apparently an oligolege of Compositae, visits flowers of *Bidens coronata*, *Helianthus divaricatus*, *H. grosseserratus*, *Solidago*.

*Andrena (Pterandrena) duplicata* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 144, figs. 24-26, 28. ♀, ♂.

**fulvipennis** Smith. N. J. to Fla. on coastal plain, also east. Tex. Pollen: Apparently an oligolege of Compositae, visits flowers of *Aster*, *Chrysopsis mariana*, *Coreopsis*, *Haplopappus*, *Heterotheca latifolia*, *H. subarillaris*, *Gutierrezia texana*.

*Andrena fulvipennis* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 117. ♀.

Taxonomy: Viereck, 1902. Ent. News 13: 237. ♀. — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 145-146, figs. 24-25, table 4 (redescription).



- gardineri** Cockerell. Md. to Ga., west to S. Dak., Colo. and Tex. Pollen: Apparently an oligolege of early summer flowering Compositae, especially *Senecio* including *S. aureus*, *S. pauperculus* var. *balsamitae*, *S. smallii*, *S. multilobatus*, *S. triangularis*, but visits other flowers including *Aster*, *Astragalus striatus*, *Baileya multiradiata*, *Crepis runcinata*, *Geraea*, *Hymenoxys glabra*, *Lesquerella ovalifolia*, *Penstemon*, *Rubus*.  
*Andrena* (*Pterandrena*) *gardineri* Cockerell, 1906. Ann. and Mag. Nat. Hist. (7) 17: 307. ♀.  
*Andrena ashmeadi* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 45. ♀.  
*Andrena* (*Opandrena*) *lamellicauda* Cockerell, 1925. Ann. and Mag. Nat. Hist. (9) 16: 629. ♂.  
*Andrena campbelli* Cockerell, 1933. Pan-Pacific Ent. 9: 153. ♂.
- Taxonomy: Lanham, 1941. Ent. Soc. Amer., Ann. 34: 711 (tax. characters). —Lanham, 1951. In Linsley In Muesebeck, Krombein and Townes, U. S. Dept. Agr., Agr. Monog. 2: 1066 (synonymy). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 146-147, figs. 24-26, table 4 (redescription).
- Biology: Clements and Long, 1923. Carnegie Inst. Wash., Pub. 366: 249 (ecology).
- haynesi** Viereck and Cockerell. Alta. and N. Dak., south to Tex. Pollen: Oligolege of *Helianthus*, mostly *H. petiolaris*, but also visits other flowers presumably for nectar including *Campanula*, *Echinacea pallida*, *Solidago rigida*.  
*Andrena haynesi* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 26. ♀.
- Taxonomy: Cockerell, 1931. Amer. Mus. Novitates 458: 14. ♀ (key).
- helianthi** Robertson. Que. south to Va., west to Alta., Oreg., Calif. and Ariz. Pollen: Oligolege of Compositae, apparently preferring the flowers of *Helianthus* including *H. annuus*, *H. coloradinus*, *H. coronatus*, *H. divaricatus*, *H. giganteus*, *H. grosseserratus*, *H. maximilliani*, *H. petiolaris*, *H. rigidus*, *H. subrhomboides*, *H. tuberosus*, but also visits other flowers including *Aster novaeangliae*, *Bidens aristosa*, *Chrysothamnus nauseosus*, *Cirsium undulatum*, *Cleome serrulata*, *Gilia*, *Gutierrezia sarothrae*, *Medicago sativa*, *Rudbeckia laciniata*, *Silphium perfoliatum*, *Solidago canadensis*, *S. rigida*, *Verbesina encelioides*, *V. oreophila*.  
*Andrena helianthi* Robertson, 1891. Amer. Ent. Soc., Trans. 18: 55. ♀, ♂.  
*Andrena nitidior* Cockerell, 1900. Ann. and Mag. Nat. Hist. (7) 5: 406. ♀.  
*Andrena graenicheri* Cockerell, 1902. Ann. and Mag. Nat. Hist. (7) 9: 104. ♀.  
*Andrena lincolnella* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 46. ♀.
- Taxonomy: Robertson, 1902. Amer. Ent. Soc., Trans. 28: 194. ♀, ♂. —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 147-148, figs. 24-25 (redescription). —LaBerge, 1967. Nebr. Univ. State Mus., Bul. 7: 94-101, figs. 8, 94-98, table 3 (redescription, synonymy).
- Biology: Hicks, 1926. Colo. Univ., Studies 15: 222 (nesting habits).
- helianthiformis** Viereck and Cockerell. Mont. and N. Dak., south to Kans. Pollen: Apparently an oligolege of *Echinacea* including *E. angustifolia*, *E. pallida*, but also visits other flowers including *Amorpha canescens*, *Gaillardia*, *Helopsis helianthioides*, *Melilotus officinalis*.  
*Andrena helianthiformis* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 26. ♀.
- humeralis** LaBerge. Tex. Pollen: Unknown, but visits flowers of *Aster*, *Baccharis*.  
*Andrena* (*Callandrena*) *humeralis* LaBerge, 1967. Nebr. Univ. State Mus., Bul. 7: 76. ♀, ♂.
- ignota** LaBerge. S. C. (Florence).  
*Andrena* (*Callandrena*) *ignota* LaBerge, 1967. Nebr. Univ. State Mus., Bul. 7: 83. ♀.
- irrasus** LaBerge. Ill., Nebr., Kans., Wyo., N. Mex. Pollen: Unknown, but visits flowers of *Amphichyris dracunculoides*, *Aster*, *Chrysothamnus*.  
*Andrena* (*Callandrena*) *irrasus* LaBerge, 1967. Nebr. Univ. State Mus., Bul. 7: 131, figs. 129-133. ♀, ♂.
- isocornae** Timberlake. Calif. Pollen: Oligolege of Compositae, visits flowers of *Chrysothamnus*, *Eriogonum*, *Gaillardia*, *Gutierrezia californica*, *G. lucida*, *G. sarothrae*, *Haplopappus bernardinus*, *H. vernonioides*, *Heterotheca grandiflora*, *Senecio douglasii*, *Solidago*.  
*Andrena* (*Pterandrena*) *isocornae* Timberlake, 1951. U. S. Natl. Mus., Proc. 101: 378. ♀, ♂.

- krigiana** Robertson. Conn. to Fla., west to Minn., Okla. and Tex. Pollen: Oligolege of *Krigia* including *K. biflora*, *K. virginia*, but visits other flowers presumably for nectar including *Cornus*, *Hieraceum venosum*, *Ranunculus acris*.  
*Andrena krigiana* Robertson, 1901. Canad. Ent. 33: 229. ♀, ♂.  
*Andrena (Ptilandrena) parakrigiana* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 157. ♂.
- Taxonomy: Robertson, 1902. Amer. Ent. Soc., Trans. 28: 194. ♀, ♂. — Viereck, 1917 (1916). Conn. State Geol. and Nat. Hist. Survey, Bul. 22: 777. ♀, ♂. — LaBerge, 1967. Nebr. Univ. State Mus., Bul. 7: 157-162, figs. 12, 159-163 (redescription, synonymy).
- levipes** LaBerge. Oreg., Calif. Pollen: Collects pollen from the flowers of *Lasthenia chrysostoma* and *Linanthus aureus*, but visits other flowers including *Arenaria*, *Coreopsis bigelovii*, *Cryptantha*, *Gilia*, *Phacelia distans*.  
*Andrena (Callandrena) levipes* LaBerge, 1967. Nebr. Univ. State Mus., Bul. 7: 289, figs. 336-340. ♀, ♂.
- melliventris** Cresson. Kans. to Tex., Ariz.? Pollen: Unknown, but visits flowers of *Aster tanacetifolium*, *Coreopsis cardaminefolia*, *Gaillardia pulchella*, *Monarda punctata*.  
*Andrena melliventris* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 257. ♀.
- monticola** LaBerge. Ariz. (Chiricahua Mts.); Mexico (Chihuahua, Durango, Guanajuato and Mexico). Pollen: Unknown, but visits flowers of *Aster*, *Cirsium*, *Heliopsis*, *Solidago*.  
*Andrena (Callandrena) monticola* LaBerge, 1967. Nebr. Univ. State Mus., Bul. 7: 125, figs. 119-123. ♀, ♂.
- neomexicana** LaBerge. Ariz., N. Mex. Pollen: Unknown, but visits flowers of *Baileya pleniradiata*, *Erigeron*.  
*Andrena (Callandrena) neomexicana* LaBerge, 1967. Nebr. Univ. State Mus., Bul. 7: 246, figs. 272-276. ♀, ♂.
- ofella** LaBerge. Tex., N. Mex., Ariz. Pollen: Unknown, but visits flowers of *Aplopappus gracilis*, *Chrysothamnus*, *Gutierrezia microcephala*, *G. sarothrae*.  
*Andrena (Callandrena) ofella* LaBerge, 1967. Nebr. Univ. State Mus., Bul. 7: 267, figs. 307-311. ♀, ♂.
- pecosana** Cockerell. N. Mex., Colo., Utah, Ariz.; Mexico (Chihuahua, Hidalgo, Jalisco and Zacatecas). Pollen: Unknown, but presumably an oligolege of Compositae, visits flowers of *Grindelia*, *Gutierrezia sarothrae*, *Helianthus*, *Heliopsis viguiera annua*.  
*Andrena pecosana* Cockerell, 1913. Ann. and Mag. Nat. Hist. (8) 12: 104. ♀.  
*Andrena townsendi* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 49. ♀.  
*Andrena colletoides* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 27. ♂.
- Taxonomy: LaBerge, 1967. Nebr. Univ. State Mus., Bul. 7: 112-116, figs. 9, 84-88 (redescription, synonymy, floral relationships).
- pectidis** (Cockerell). N. Mex., Tex. Pollen: Unknown, but visits flowers of *Pectis papposa*.  
*Panurgus pectidis* Cockerell, 1897. Amer. Ent. Soc., Trans. 24: 148. ♀.
- Taxonomy: Cockerell and Porter, 1899. Ann. and Mag. Nat. Hist. (7) 4: 418 (tax. characters).
- perpunctata** LaBerge. Ariz. (Chiricahua Mts.); Mexico (Guerrero, Mexico and Morelos). Pollen: Unknown, but visits flowers of *Heterotheca subzillaris*.  
*Andrena (Callandrena) perpunctata* LaBerge, 1967. Nebr. Univ. State Mus., Bul. 7: 222, figs. 243-247. ♀, ♂.
- placata** Mitchell. Que. and Ont., south to N. C. west to Minn. and Ill. Pollen: Oligolege of *Solidago*, but visits other flowers including *Aster lateriflorum*, *A. macrophyllum*, *Eupatorium serotinum*, *Fagopyrum esculentum*. This species evidently hybridizes occasionally throughout its range with the closely related *A. simplex* Smith.  
*Andrena (Pterandrena) placata* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 148, figs. 24, 25. ♂.
- reflexa** Cresson. Tex.; Mexico (Chihuahua, Jalisco and Michoacan). Pollen: Unknown, but visits flowers of *Crotalaria longirostrata*.  
*Andrena reflexa* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 256. ♂.  
*Andrena pernitens* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 257. ♀.

**Taxonomy:** LaBerge, 1967. Nebr. Univ. State Mus., Bul. 7: 70-74, figs. 55-59 (redescription, synonymy).

**rudbeckiae** Robertson. N. C. to Mich., Wis., Minn. and Colo., south to Tex. in the Great Plains States. Pollen: Oligolege of Compositae, especially *Ratibida* including *R. columnaris*, *R. columnifera*, *R. pinnata* and *Rudbeckia* including *R. hirta*, *R. lanceolata*, *R. triloba*, but visits other flowers including *Centaurea americana*, *Chrysopsis*, *Coreopsis*, *Echinacea angustifolia*, *Gaillardia pulchella*, *Lepachys*, *Verbesina helianthioides*.

*Andrena rudbeckiae* Robertson, 1891. Amer. Ent. Soc., Trans. 18: 56. ♀, ♂.

**Taxonomy:** Cockerell, 1899. Ent. News 10: 255. ♂ (key). — Robertson, 1902. Amer. Ent. Soc., Trans. 28: 194. ♀, ♂ (key). — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 149, 151, figs. 25-28, table 4 (redescription). — LaBerge, 1967. Nebr. Univ. State Mus., Bul. 7: 90-94, figs. 7 (redescription).

**senticulosa** LaBerge. Tex. Pollen: Unknown, but visits flowers of *Berlandiera*, *Engelmannia bipinnatifida*, *Pyrrophappus*, *Serinia oppositifolia*.

*Andrena (Callandrena) senticulosa* LaBerge, 1967. Nebr. Univ. State Mus., Bul. 7: 177, 189-193. ♀, ♂.

**simplex** Smith. N. H. to N. C., west to Minn., Nebr. and Kans. Pollen: Oligolege of Compositae, especially *Aster* and *Solidago*, visits flowers of *Amphiachyris dracunculoides*, *Aster anomalus*, *A. azureus*, *A. commutatus*, *A. ericoides*, *A. e. vilosus*, *A. laterifolius*, *A. multiflorus*, *A. novaeangeliae*, *A. paniculatus*, *A. praelatus*, *Boltonia asteroides*, *Eupatorium perfoliatum*, *Euthamia graminifolia*, *Gnaphalium polycephalum*, *Grindelia*, *Helianthus tuberosus*, *Polygonum hydropiperoides*, *P. scandens*, *Solidago altissima*, *S. canadensis*, *S. graminifolia*, *S. lanceolata*, *S. nemoralis*, *S. rigida*, *S. serotina*. Predator: *Philanthus solivagus* Say. This species evidently hybridizes occasionally throughout its range with the closely related *A. placata* Mitchell.

*Andrena simplex* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 114. ♀.

*Andrena solidaginis* Robertson, 1893. Amer. Ent. Soc., Trans. 18: 55. ♀, ♂.

*Andrena radmitricha* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 51. ♀.

*Andrena (Ptilandrena) determinata* Viereck, 1917. Amer. Ent. Soc., Trans. 43: 394. ♀.

**Taxonomy:** Morice and Cockerell, 1901. Canad. Ent. 33: 124 (type). — Cockerell, 1906. Psyche 13: 8 (type). — LaBerge, 1967. Nebr. Univ. State Mus., Bul. 7: 137-143, figs. 10, 134-138, table 4 (redescription, synonymy, floral relationships).

**simulata** Smith. Ariz., N. Mex., Colo.; Mexico. Pollen: Unknown, but visits flowers of *Aster*, *Viguiera annua*.

*Andrena simulata* Smith, 1879. Descr. n. spp. Hymen. Brit. Mus., p. 52. ♀.

*Andrena aureocincta* Cockerell, 1896. Ann. and Mag. Nat. Hist. (6) 18: 88. ♀, ♂.

**Taxonomy:** Cockerell, 1898. Denison Univ. Sci. Labs., Bul. 11: 48. ♂ (as *aureocincta*).

— LaBerge, 1967. Nebr. Univ. State Mus., Bul. 7: 189-193, figs. 204-208 (redescription, synonymy).

**sitiliae** Viereck. Okla., Tex. Pollen: Possibly an oligolege of *Pyrrophappus* including *P. carolinianus*, but also visits *Coreopsis tinctoria*.

*Andrena sitiliae* Viereck, 1909. Ent. Soc. Wash., Proc. 11: 144. ♀.

**sonorensis** LaBerge. Ariz. (Show Low), N. Mex. (Carizozo). Pollen: Unknown, but visits flowers of *Gutierrezia microcephala*.

*Andrena (Callandrena) sonorensis* LaBerge, 1967. Nebr. Univ. State Mus., Bul. 7: 110, figs. 99-103. ♀, ♂.

**tegaris** LaBerge. Ariz. (Chiricahua and Santa Rita Mts.). Pollen: Unknown, but visits flowers of *Heliopsis*.

*Andrena (Callandrena) tegaris* LaBerge, 1967. Nebr. Univ. State Mus., Bul. 7: 195, figs. 209-213. ♀, ♂.

**texana** Cresson. Tex. (Roosevelt and Victoria); Mexico (San Luis Potosi). Pollen: Unknown, but visits flowers of *Amphiachyris*, *Aster*.

*Andrena texana* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 258. ♂.

**tonkaworum** Viereck. Nebr., Kans., Colo., Tex., N. Mex. Pollen: Possibly an oligolege of *Engelmannia*.

*Andrena (Ptilandrena) tonkaworum* Viereck, 1917. Amer. Ent. Soc., Trans. 43: 396. ♀.

**trimaculata** LaBerge. Ariz. (Canelo); Mexico (Durango).

*Andrena (Callandrena) trimaculata* LaBerge, 1967. Nebr. Univ. State Mus., Bul. 7: 68, figs. 50-54. ♀, ♂.

**utahensis** LaBerge. Utah, Colo., Ariz. Pollen: Unknown but visits flowers of *Geraea*.

*Andrena (Callandrena) utahensis* LaBerge, 1967. Nebr. Univ. State Mus., Bul. 7: 258, figs. 292-296. ♀, ♂.

**verbesinae** Viereck and Cockerell. Tex. (Cotulla and San Antonio). Pollen: Unknown, but visits flowers of *Verbesina encelioides*.

*Andrena verbesinae* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 1. ♀, ♂.

**verecunda** Cresson. Tex. Pollen: Unknown, but visits flowers of *Engelmannia bipinnatifida*, *Gaillardia*, *Pyrrhopappus carolinianus*, *P. grandiflora*.

*Andrena verecunda* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 257. ♀.

**vulpicolor** Cockerell. Wyo., south to N. Mex., west to Oreg. and Calif. Pollen: Apparently an oligolege of *Chrysothamnus* including *C. nauseosus*, *C. n. albicaulis*, *C. n. consimilis*, *C. parryi*, *C. viscidiflorus pumilis*, *C. v. stenophyllus*, but also visits flowers of *Erigeron neomexicana*.

*Andrena vulpicolor* Cockerell, 1897. Ann. and Mag. Nat. Hist. (6) 20: 512. ♀.

*Andrena nubilipennis* Viereck, 1904. Canad. Ent. 36: 193. ♀.

Taxonomy: Cockerell, 1898. Denison Univ. Sci. Labs., Bul. 11: 49. ♀ (key). —Cockerell, 1931. Amer. Mus. Novitates 458: 13. ♀ (key). —LaBerge, 1967. Nebr. Univ. State Mus., Bul. 7:

106-110, figs. 6, 79-83 (redescription, synonymy).

#### Genus ANDRENA Subgenus CHAULANDRENA LaBerge

*Andrena* subg. *Chaulandrena* LaBerge, 1964. Nebr. Univ. State Mus., Bul. 4: 314.

Type-species: *Andrena porterae* Cockerell. Orig. desig.

Taxonomy: LaBerge, 1964. Nebr. Univ. State Mus., Bul. 4: 284, 288, 314-315 (tax. characters).

**porterae** Cockerell. Sierra Nevada, Cascade and Rocky Mts. to N. Mex. Parasite: *Stylops* sp.

Pollen: Apparently oligolectic, presumably gathers pollen from the flowers of *Ribes*.

*Andrena porterae* Cockerell, 1900. Ann. and Mag. Nat. Hist. (7) 5: 401. ♀.

*Andrena leptanthi* Viereck and Cockerell, 1904. Ann. and Mag. Nat. Hist. (7) 14: 27. ♂.

Taxonomy: Linsley, 1938. Calif. Acad. Sci., Proc. (4) 23: 264, 267. ♀, ♂.

Biology: Linsley, 1937. Pan-Pacific Ent. 13: 157 (stylopization).

#### Genus ANDRENA Subgenus CNEMIDANDRENA Hedicke

*Andrena* subg. *Cnemidandrena* Hedicke, 1933. Berlin Zool. Mus., Mitt. 19: 212.

Type-species: *Melitta nigriceps* Kirby. Orig. desig.

Revision: Donovan, 1977. Calif. Univ. Pubs. Ent. 81: 1-107, 130 figs., 17 maps (N. Amer. spp.; received too late for inclusion in this catalog).

Taxonomy: Lanham, 1949. Calif. Univ. Pubs. Ent. 8: 211 (tax. characters). —LaBerge, 1964.

Nebr. Univ. State Mus., Bul. 4: 303 (tax. characters).

**antonitoni** Viereck and Cockerell. Colo.

*Andrena antonitoni* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 56. ♀.

**apacheorum** Cockerell. Rocky Mts. to N. Mex., Ariz.

*Andrena apacheorum* Cockerell, 1897. Entomologist 30: 306. ♀.

Taxonomy: Cockerell, 1931. Amer. Mus. Novitates 458: 14, 15. ♀, ♂ (key).

Biology: Clements and Long, 1923. Carnegie Inst. Wash., Pub. 336: 249 (ecology). —Hicks, 1926. Univ. Colo., Studies 15: 221 (habits).

**autumnalis** Viereck and Cockerell. Nebr.

*Andrena autumnalis* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 44. ♀.

**beulahensis** Viereck. N. Mex.

*Andrena beulahensis* Viereck, 1903. Amer. Ent. Soc., Trans. 29: 53. ♀.

**canadensis canadensis** Dalla Torre. N. S. to N. Y. and N. J., west to Minn. Pollen: Unknown, but visits flowers of *Aster*, *Epilobium*, *Solidago*.

*Andrena simulata* Provancher, 1888. Addit. Corr. Faune Ent. Canada, Hym., p. 313. ♀, ♂. Preocc.

*Andrena canadensis* Dalla Torre, 1896. Cat. Hym., v. 10, p. 107. N. name.

*Andrena (Pterandrena) persimilis* Graenicher, 1904. Ent. News 15: 66. ♀.

Taxonomy: Viereck, 1907. Ent. News 18: 282, 286. ♀, ♂ (key). —Atwood, 1934. Canad. Jour. Res. 10: 207, 209, fig. ♀, ♂ (key). —Timberlake, 1951. In Muesebeck, Krombein and Townes, U. S. Dept. Agr., Agr. Monog. 2: 1059 (synonymy). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 172, figs. 30-31, 33, table 4 (redescription).

Biology: Salt, 1927. Jour. Expt. Zool. 48: 245 (stylopization).

**canadensis oslarella** Viereck and Cockerell. Colo., N. Mex.

*Andrena canadensis oslarella* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 28. ♂.

Biology: Clements and Long, 1923. Carnegie Inst. Wash. Pub. 336: 249 (ecology).

**chromotricha** Cockerell. N. Mex., Wis.

*Andrena chromotricha* Cockerell, 1899. Entomologist 32: 128. ♀.

*Andrena clypeonitens* Cockerell, 1902. Canad. Ent. 34: 47. ♀.

*Andrena truncata* Viereck, 1903. Amer. Ent. Soc., Trans. 29: 53. ♀.

Taxonomy: Graenicher, 1910. Canad. Ent. 42: 160. ♂. —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 172-173, table 4 (redescription of female).

**citrinihirta** Viereck. Calif. Pollen: Unknown, but visits flowers of *Chrysanthamnus*, *Heterotheca grandiflora*, *Solidago californica*.

*Andrena (Andrena) citrinihirta* Viereck, 1917. Amer. Ent. Soc., Trans. 43: 371. ♀.

**colletina** Cockerell. B. C. to Calif., east to Colo. Pollen: Unknown, but visits flowers of *Achillea millefolium*, *Chrysanthamnus nauseosus consimilis*, *C. viscidiflorus typicus*, *Haplopappus bloomeri* var. *angustatus*.

*Andrena colletina* Cockerell, 1906. Amer. Mus. Nat. Hist., Bul. 22: 454. ♂.

Taxonomy: Cockerell, 1909. Ann. and Mag. Nat. Hist. (8) 5: 260. ♀. —Cockerell, 1931. Amer. Mus. Novitates 458: 14, 15. ♀, ♂ (key).

**columbiana** Viereck. B. C. to Calif., N. Mex. Pollen: Unknown, but visits flowers of *Achillea lanulosa*, *Erigeron coulteri*, *E. pygmaeus*, *Microseris nutans*, *Senecio aureus* var. *subnudus*, *S. canus*, *S. integririmus*, *S. scorzonella*.

*Andrena (Andrena) columbiana* Viereck, 1917. Amer. Ent. Soc., Trans. 43: 374. ♀.

**costillensis** Viereck and Cockerell. Colo., N. Mex.

*Andrena costillensis* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 50. ♀.

Taxonomy: Cockerell, 1931. Amer. Mus. Novitates 458: 14. ♀, ♂.

**davidsoni** Viereck and Cockerell. Calif.

*Andrena davidsoni* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 52. ♀.

Taxonomy: Cockerell, 1930. Pan-Pacific Ent. 7: 8. ♀ (key).

**hirticincta** Provancher. Alta. to N. S., south to Ga. Pollen: Unknown, but visits flowers of *Aster*, *Epilobium*, *Solidago*.

*Andrena fimbriata* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 116. ♀, ♂. Preocc.

*Andrena hirticincta* Provancher, 1888. Addit. Corr. Faune Ent. Canada, Hym., p. 308. ♀, ♂.

*Anthrena americana* Dalla Torre, 1896. Cat. Hym., v. 10, p. 102. N. name.

Taxonomy: Morice and Cockerell, 1901. Canad. Ent. 33: 149 (type of *fimbriata*). —Cockerell, 1906. Psyche 13: 9 (types of *fimbriata*). —Atwood, 1934. Canad. Jour. Res. 10 (2): 207, 209, fig. ♀, ♂ (key). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 173-174, figs. 30-31, 33-34, table 4 (redescription).

Biology: Salt, 1927. Jour. Expt. Zool. 48: 233, figs. (stylopization).

**indecis** Cockerell. B. C., Alta., Mont.

*Andrena costillensis indecis* Cockerell, 1937. Canad. Ent. 69: 34. ♀.

**mentzeliae** Cockerell. Colo., N. Mex. Pollen: Unknown, but visits flowers of *Mentzelia*.

*Andrena mentzeliae* Cockerell, 1897. Entomologist 30: 307. ♀.

Taxonomy: Cockerell, 1931. Amer. Mus. Novitates 458: 14, 15. ♀, ♂. —Lanham, 1941. Ent. Soc. Amer., Ann. 34: 706, 708. ♀, ♂ (key).

**nubecula** Smith. East. Canada., south to Ga., west to B. C. Pollen: Unknown, but visits flowers of *Aster*, *Euthamia*, *Solidago*. Predator: *Philanthus solivagus* Say.

*Andrena nubecula* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 117. ♀.

*Andrena nubecula tristicornis* Cockerell, 1931. Canad. Ent. 63: 22. ♀.

Taxonomy: Morice and Cockerell, 1901. Canad. Ent. 33: 150 (type). —Robertson, 1902. Amer. Ent. Soc., Trans. 28: 191, 192. ♀, ♂ (key). —Cockerell, 1906. Psyche 13: 9 (type).

—Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 174-175, figs. 31, 33-34, table 4 (redescription).

**pacta** Viereck. N. Mex.

*Andrena pacta* Viereck, 1903. Amer. Ent. Soc., Trans. 43: 54. ♀, ♂.

**peckhami** Cockerell. Minn. to Vt., south to N. C. Pollen: Unknown, but visits flowers of *Baptisia*, *Solidago*.

*Andrena peckhami* Cockerell, 1902. Ann. and Mag. Nat. Hist. (7) 9: 105. ♀.

Taxonomy: Graenicher, 1910. Canad. Ent. 42: 159. ♀, ♂. —LaBerge and Ribble, 1972. Amer. Ent. Soc., Trans. 98: 272 (subgeneric position).

**ramaleyi** Cockerell. Colo.

*Andrena ramaleyi* Cockerell, 1931. Ann. and Mag. Nat. Hist. (10) 7: 346. ♀.

Taxonomy: Cockerell, 1931. Amer. Mus. Novitates 458: 14 (key).

**robervalensis** Mitchell. Que., Mich., Minn. Pollen: Unknown, but visits flowers of *Melilotus alba*.

*Andrena* (?*Cnemidandrena*) *robervalensis* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 175. ♀.

**scutellinitens** Viereck. Oreg., Calif., Nev. Pollen: Unknown, but visits flowers of

*Chrysothamnus nauseosus speciosus*, *C. viscidiflorus typicus*, *Haplopappus bloomeri* var. *angustatus*, *Oxypholis occidentalis*, *Solidago elongata*.

*Andrena* (*Andrena*) *scutellinitens* Viereck, 1916. Acad. Nat. Sci. Phila. Proc. 68: 573. ♀, ♂.

Taxonomy: LaBerge, 1967. Nebr. Univ. State Mus., Bul. 7: 294 (subgeneric position).

**segregans** Cockerell. N. Mex.

*Andrena segregans* Cockerell, 1900. Ann. and Mag. Nat. Hist. (7) 5: 404. ♀, ♂.

**surda** Cockerell. Wyo., Colo., Oreg., Calif., N. Mex. Pollen: Unknown, but visits flowers of *Chrysothamnus nauseosus*, *C. viscidiflorus typicus*, *Erigeron pygmaeus*, *Sphenosciadium capitellatum*.

*Andrena hirticincta* var. *surda* Cockerell, 1910. Ann. and Mag. Nat. Hist. (8) 5: 264. ♂.

*Andrena pertarda* Cockerell, 1916. Entomologist 49: 157. ♀.

Taxonomy: Cockerell, 1931. Amer. Mus. Novitates 458: 13, 14. ♀, ♂ (key). —Lanham, 1941.

Ent. Soc. Amer., Ann. 34: 706, 708. ♀, ♂ (key). —Timberlake, 1951. In Linsley In Muesebeck, Krombein and Townes, U. S. Dept. Agr., Agr. Monog. 2: 1082 (synonymy).

**xanthigera** Cockerell. N. Mex.

*Andrena xanthigera* Cockerell, 1900. Ann. and Mag. Nat. Hist. (7) 5: 402. ♀.

*Andrena albovirgata* Cockerell, 1900. Ann. and Mag. Nat. Hist. (7) 5: 403. ♀.

Taxonomy: Cockerell, 1931. Canad. Ent. 63: 22. ♀. —Cockerell, 1931. Amer. Mus. Novitates 458: 19. ♀.

#### Genus ANDRENA Subgenus CONANDRENA Viereck

*Andrena* subg. *Conandrena* Viereck, 1924. Canad. Ent. 56: 20.

Type-species: *Andrena bradleyi* Viereck. Monotypic and orig. desig.

Taxonomy: Lanham, 1949. Calif. Univ. Pubs. Ent. 8: 206 (tax. characters). —LaBerge, 1964. Nebr. Univ. State Mus., Bul. 4: 284, 288, 300 (tax. characters).

- bradleyi** Viereck. Colo. to N. S., south to Ga. Pollen: Unknown, but visits flowers of *Prunus*, *Pyrus*, *Rhododendron*, *Ribes*, *Vaccinium*.  
*Andrena bradleyi* Viereck, 1907. Ent. News 18: 285, 286. ♀, ♂.  
*Andrena saccharina* Cockerell and Rohwer, 1907. Ann. and Mag. Nat. Hist. (4) 20: 128. ♂.
- Taxonomy: Atwood, 1934. Canad. Jour. Res. 10: 206, 208, figs. ♀, ♂ (key). — Timberlake, 1951. In Linsley In Muesebeck, Krombein and Townes, U. S. Dept. Agr., Agr. Monog. 2: 1059 (synonymy). — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 226-228, figs. 40, 46-47, 49-50 (redescription).
- Biology: Salt, 1927. Jour. Expt. Zool. 48: 249 (stylopization).
- carolina** Viereck. Minn. to N. S., south to Tenn. and Ga. Pollen: Unknown, but visits flowers of *Azalea*, *Claytonia*, *Dentaria*, *Ledum*, *Pyrus*, *Rhodora*, *Vaccinium*.  
*Andrena carolina* Viereck, 1909. Ent. News 20: 126. ♀.
- Taxonomy: Atwood, 1934. Canad. Jour. Res. 10: 208, 209. ♀, ♂. — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 228-229, figs. 40, 45-46, 49 (redescription, flower records).
- cheyennorum** Viereck and Cockerell. Nebr., Wyo., Idaho.  
*Andrena cheyennorum* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 20. ♀, ♂.  
*Andrena angustifrons* Cockerell, 1934. Pan-Pacific Ent. 9: 155. ♀.
- Taxonomy: Timberlake, 1951. In Linsley In Muesebeck, Krombein and Townes, U. S. Dept. Agr., Agr. Monog. 2: 1061 (synonymy).
- durangoensis** Viereck and Cockerell. Colo. to N. S., south to W. Va. Ecology: Unknown, but visits flowers *Ilex*, *Rubus*.  
*Andrena durangoensis* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 36. ♂.  
*Andrena (Andrena) media* Viereck, 1922. Boston Soc. Nat. Hist., Occas. Papers 5: 41. ♂.
- Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 229-230, figs. 40, 45, 46 (redescription, synonymy).
- rufosignata** Cockerell. Minn. to N. B. and New England states.  
*Andrena rufosignata* Cockerell, 1902. Canad. Ent. 34: 46. ♀.
- Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 230, fig. 49 (redescription, subgeneric assignment). — Knerer and Atwood, 1963. Canad. Ent. 95: 585, figs. 5, 7. ♂.

#### Genus ANDRENA Subgenus DACTYLANDRENA Viereck

- Andrena* subg. *Dactylandrena* Viereck, 1924. Canad. Ent. 56: 20.  
 Type-species: *Andrena (Dactylandrena) maura* Viereck. Monotypic and orig. desig.
- Taxonomy: Lanham, 1949. Calif. Univ. Pubs. Ent. 8: 204 (tax. characters). — LaBerge, 1964. Nebr. Univ. State Mus., Bul. 4: 285, 288, 299 (tax. characters).
- berberidis** Cockerell. Colo. Pollen: Unknown, but visits flowers of *Berberis*.  
*Andrena milwaukeeensis* var. *berberidis* Cockerell, 1905. Canad. Ent. 37: 371. ♀.
- Taxonomy: Cockerell, 1914. Ann. and Mag. Nat. Hist. (8) 13: 9. ♂. — Lanham, 1941. Ent. Soc. Amer., Ann. 34: 705, 707. ♀, ♂ (key).
- caliginosa** Viereck. Calif. Pollen: Unknown, but possibly an oligolege of *Ribes*.  
*Andrena (Andrena) caliginosa* Viereck, 1916. Acad. Nat. Sci. Phila., Proc. 68: 552. ♀.  
*Andrena (Dactylandrena) maura* Viereck, 1924. Canad. Ent. 56: 31. ♂ (♀ misdet.).
- Taxonomy: Linsley, 1938. Calif. Acad. Sci., Proc. (4) 23: 267. ♀, ♂ (key).
- submaura** Linsley. South. Calif. (The Gavilan and Sandbergs). Pollen: Unknown, but possibly gathers pollen from *Ribes indecorum*.  
*Andrena submaura* Linsley, 1938. Calif. Acad. Sci., Proc. (4) 23: 269. ♂, ♀.

#### Genus ANDRENA Subgenus DERANDRENA Ribble

- Andrena* subg. *Derandrena* Ribble, 1968. Nebr. Univ. State Mus., Bul. 8: 333.  
 Type-species: *Andrena vandykei* Cockerell. Orig. desig.
- Revision: Ribble, 1968. Nebr. Univ. State Mus., Bul. 8: 333-367, figs. 90-124, maps 11-18, tables 12-14 (N. Amer. spp.).

- arctostaphylae** Ribble. Calif. Pollen: Apparently an oligolege of *Arctostaphylos* including *A. crustacea*, *A. glauca*, *A. mariposa*, *A. pungens*.  
*Andrena* (*Derandrena*) *arctostaphylae* Ribble, 1968. Nebr. Univ. State Mus., Bul. 8: 344, figs. 95-99, map 12. ♀, ♂.
- californiensis** Ribble. Calif. Pollen: Unknown, most often collected on flowers of *Salix* including *S. argophylla*, *S. lasiolepis*, but visits a wide variety of flowers including *Arctostaphylos pungens*, *Cryptantha intermedia*, *Descourainia sophia*, *Eriodictyon californicum*, *Gilia multicaulis*, *Lasthenia chrysostoma*, *Lomatium dasycarpum*, *Orthocarpus*, *Plagiobothrys nothofulvus*, *Quercus*, *Rhamnus crocea*, *Rhus trilobata*, *Ribes indecorum*, *Salvia columbariae*, *Sisymbrium irio*, *Tamarix gallica*, *Trifolium*.  
*Andrena* (*Derandrena*) *californiensis* Ribble, 1968. Nebr. Univ. State Mus., Bul. 8: 348, figs. 100-104, map 13, table 13. ♀, ♂.
- hermosa** Ribble. Calif. (Central Valley). Pollen: Unknown, but possibly oligolectic on *Lasthenia*.  
*Andrena* (*Derandrena*) *hermosa* Ribble, 1968. Nebr. Univ. State Mus., Bul. 8: 360, figs. 115-119, map 18. ♀, ♂.
- murietae** Ribble. Calif. (11 miles northwest of California Hot Springs). *A. penutiani* Ribble may be the male.  
*Andrena* (*Derandrena*) *murietae* Ribble, 1968. Nebr. Univ. State Mus. Bul. 8: 346. ♀.
- penutiani** Ribble. Cent. Calif. Pollen: Unknown, but visits flowers of *Lasthenia*. *A. murietae* Ribble may be the female.  
*Andrena* (*Derandrena*) *penutiani* Ribble, 1968. Nebr. Univ. State Mus., Bul. 8: 352, map 15. ♂.
- timberlakei** Cockerell. Calif. (San Benito and Tulare Cos., south to Riverside Co.). Pollen: Based upon the mouth parts of the female, this species evidently collects pollen from the flowers of *Cryptantha* including *C. intermedia*, but visits other flowers presumably for nectar including *Descourainia sophia*, *Encelia farinosa*, *Lomatium dasycarpum*, *Plagiobothrys californicus*, *P. nothofulvus*, *Rhamnus crocea*.  
*Andrena timberlakei* Cockerell, 1929. Ann. and Mag. Nat. Hist. (10) 4: 300. ♀, ♂.
- Taxonomy: Cockerell, 1931. Canad. Ent. 64: 158. ♀, ♂.
- vandykei** Cockerell. South. Oreg. (12 miles southwest of Keno), Calif.; Mexico (Baja California). Pollen: Unknown, most often collected on flowers of *Arctostaphylos* including *A. crustacea*, *A. glauca*, *A. mariposa*, *A. pungens* as well as *Ceanothus* including *C. arboreus*, *C. cuneatus*, *C. foliosus*, but visits other flowers including *Baccharis*, *Phoradendron villosum*, *Rhamnus crocea*, *Rhus diversiloba*, *R. ovata*, *Salix*, *Tamarix*, *Xylococcus bicolor*.  
*Andrena* (*Micrandrena*) *solutula* Cockerell, 1936. Pan-Pacific Ent. 12: 150. ♀.  
*Andrena* (*Micrandrena*) *vandykei* Cockerell, 1936. Pan-Pacific Ent. 12: 151. ♂.
- viridissima** Ribble. Calif.; Mexico (Baja California). Pollen: Unknown, but visits flowers of *Brassica*, *Lasthenia tenella*, *Nemophila racemosa*, *Phacelia ciliata*, *P. distans*, *P. douglasii*, *Pholisma racemosa*, *Ranunculus canus*.  
*Andrena* (*Derandrena*) *viridissima* Ribble, 1968. Nebr. Univ. State Mus., Bul. 8: 360, figs. 115-119, map 18. ♀, ♂.
- ziziaeformis** Cockerell. Mass. to Ga., Tenn., Ill. Pollen: Unknown, but visits flowers of *Potentilla* including *P. canadensis*, *Rubus*, *Waldsteinia*.  
*Andrena ziziaeformis* Cockerell, 1908. Canad. Ent. 40: 234. ♀.
- Taxonomy: Cockerell, 1932. Canad. Ent. 64: 157. ♀ (key). — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 169-171, figs. 29-32 (redescription).

### Genus ANDRENA Subgenus DIANDRENA Cockerell

*Diandrena* Cockerell, 1903. Psyche 10: 75.

Type-species: *Panurgus chalybaeus* Cresson. Orig. desig.

Revision: Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 1-146, 88 figs, 5 tables, 13 maps (N. Amer. spp., includes comparative ecological information).



**Taxonomy:** Lanham, 1949. Calif. Univ. Pubs. Ent. 8: 219-220 (tax. characters). —Linsley and MacSwain, 1961. Pan-Pacific Ent. 37: 31-41 (*Camissonia* visiting spp.). —LaBerge, 1964. Nebr. Univ. State Mus., Bul. 4: 283, 287, 309-310 (tax. characters). —Linsley, MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 71: 13-26, figs. 6-11 (*Camissonia* visiting spp. of Calif. and Baja Calif.).

**Biology:** Linsley, MacSwain and Raven, 1964. Calif. Univ. Pubs. Ent. 33: 74-75, pls. 1-3 (floral relationships of Mojave Desert spp.). —Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 14-43, 124-128, figs. 1-2, tables 1-5 (nest architecture, life history, comparative ecology, parasites, predators). —Linsley, MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 71: 13-26, 47-50, tables 1-2 (life history, floral relationships of *Camissonia* visiting spp.).

**ablegata** (Cockerell). Idaho, Wyo., Colo., Utah Calif. Pollen: Oligolectic on ligulate Compositae, most likely collects pollen from early morning-opening flowers of the subtribe Microseridinae including *Agoseris glauca*, *Microseris nutans*, *Taraxacum officinale*, but visits other flowers including *Camissonia subacaulis*, *Cardaria draba*, *Lomatium dissectum*.

*Diandrena ablegata* Cockerell, 1922. Amer. Mus. Novitates 40: 1. ♀.

**Taxonomy:** Linsley and MacSwain, 1961. Pan-Pacific Ent. 37: 32-33 (tax. characters). —Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 93-95, figs. 1, 29-30, 56, map 7 (redescription).

**agoseridis** Thorp. Calif. Pollen: Collects pollen from ligulate Compositae, primarily from *Agoseris heterophylla*, *Anisocoma acaulis*, but visits other flowers including *Calycoseris parryi*, *Camissonia campestris campestris*, *C. pallida pallida*, *Descourainia sophia*, *Erodium cicutarium*, *Euphorbia albomarginata*, *Hesperochiron*, *Lasthenia chrysostoma*, *Layia glandulosa*, *Malacothrix californica*, *M. glabrata*, *Phacelia ciliata*, *Rafinesquia neomexicana*, *Sisymbrium*, *Tamarix gallica*.

*Andrena* (*Diandrena*) *agoseridis* Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 116, figs. 1, 49-50, 56, map 12. ♀, ♂.

**anatolis** Linsley and MacSwain. South. Calif.; Mexico (Baja California). Pollen: Collects pollen from morning-opening flowers of *Camissonia* including *C. bistorta*, *C. campestris*, *C. cheiranthifolia suffruticosa*, but visits other flowers including *Calandrinia ciliata*, *Camissonia crassifolia*, *Ceanothus crassifolius*, *Cryptantha intermedia*, *Potentilla*, *Sitanion* for nectar.

*Andrena* (*Diandrena*) *anatolis* Linsley and MacSwain, 1961. Pan-Pacific Ent. 37: 36. ♀, ♂.

**Taxonomy:** Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 98-99, figs. 1, 33-34, 56, map 8. ♀, ♂ (redescription).

**Biology:** Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 99, fig. 1 (floral relationships). —Linsley, MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 71: 21-22, 49, fig. 9 (floral relationships).

**apasta** Linsley and MacSwain. Calif. Pollen: Collects pollen from morning-opening flowers of *Camissonia*, principally from *C. campestris*, but occasionally from *C. ovata* in northernmost localities; also visits other flowers including *Agoseris heterophylla*, *Brassica*, *Descourainia sophia*, *Layia*, *Monolopia lanceolata* for nectar.

*Andrena* (*Diandrena*) *apasta* Linsley and MacSwain, 1961. Pan-Pacific Ent. 37: 34. ♀.

**Taxonomy:** Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 118-119, figs. 1, 51-52, 56, 68, 80, map 10 (redescription).

**Biology:** Linsley, MacSwain and Raven, 1964. Calif. Univ. Pubs. Ent. 33: 75, fig. 11 (nest, floral relationships). —Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 99 (floral relationships). —Linsley, MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 71: 26, 50, fig. 11 (floral relationships).

**blennospermatis** Thorp. Calif. Pollen: Collects pollen from flowers of *Blennosperma* including *B. bakeri*, *B. nanum*.

*Andrena* (*Diandrena*) *blennospermatis* Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 81, figs. 1, 19-20, 56, 63, 75. ♀, ♂.

**chalybaea** (Cresson). Calif. (Central coast, from Mendocino to San Luis Obispo Counties).

Parasite: *Nomada* sp. Pollen: Collects pollen only from the early morning-opening

flowers of *Camissonia ovata*, but visits other flowers for nectar including

*Blennosperma bakeri*, *Brassica*, *Cryptantha*, *Ranunculus californicus*.

*Panurgus chalybaeus* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 61. ♀, ♂.

Taxonomy: Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 57-61, figs. 1, 3-4, 55-58, 69, 85-86, map 1 (redescription, post defecating larva).

Biology: Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 5-14, 59, fig. 2 (nest architecture, floral relationships, parasite). —Linsley, MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 71: 15-17, 48, fig. 6, pl. 1 (nest, floral relationships, mating).

**chalybioides** (Viereck). Wash., Oreg., Calif. Parasite: *Myopa rubida* (Bigot)? Pollen: Collects pollen almost exclusively from ligulate Compositae in the early morning, primarily from *Agoseris* including *A. heterophylla*, occasionally from introduced weedy species of Cichorieae including *Hypochoeris radicata*, *Taraxacum officinale*, but also visits other flowers for nectar including *Blennosperma*, *Ceanothus*, *Convolvulus*, *Daucus*, *Lasthenia chrysostoma*, *Layia platyglossa*, *Linum*, *Ranunculus orthorhynchus*.

*Parandrena chalybioides* Viereck, 1904. Canad. Ent. 36: 229. ♀, ♂.

*Andrena (Parandrena) perchalybea* Viereck, 1916. Acad. Nat. Sci. Phila., Proc. 68: 591. ♀.

*Diandrena purdyi* Cockerell, 1936. Pan-Pacific Ent. 12: 155. ♂.

Taxonomy: Linsley and MacSwain, 1961. Pan-Pacific Ent. 37: 31, 33 (synonymy). —Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 83-85, figs. 1, 21-22, 56 (redescription).

Biology: MacSwain and Bohart, 1947. Pan-Pacific Ent. 23: 30 (parasite). —Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 34, 85 (floral relationships, parasite).

**chlorosoma** Linsley and MacSwain. Calif. (Central Coast Ranges, from Mendocino County to Ventura County). Pollen: Collects pollen from early morning opening ligulate Compositae including *Agoseris grandiflora*, *A. heterophylla* as well as from introduced weedy species of Cichorieae including *Hypochoeris radicata*, but visits these and other flowers for nectar including *Camissonia ovata*, *Hemizonia*, *Lasthenia chrysostoma*, *Layia chrysanthemoides*, *Ranunculus californicus*, *Taraxacum officinale*.

*Andrena (Diandrena) subchalybea chlorosoma* Linsley and MacSwain, 1961. Pan-Pacific Ent. 37: 32. ♀, ♂.

Taxonomy: Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 107-111, figs. 1, 41-44, 56 (redescription).

Biology: Linsley and MacSwain, 1959. Calif. Univ. Pubs. Ent. 16: 18, 30, 31 (floral relationships, as *purdyi*). —Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 110, 111 (floral relationships).

**cuneilabris** Viereck. Oreg., Calif. Parasite: *Myopa perplexa* Camras, *M. rubida* (Bigot), *Stylops pacifica* Bohart? Pollen: Collects pollen and nectar chiefly from *Ranunculus* including *R. californicus*, *R. occidentalis*, *R. orthorhynchus*, occasionally collects pollen from *Platyglossa californicus* during periods when *Ranunculus* pollen is scarce or absent; visits other flowers for nectar including *Amsinckia*, *Agoseris grandiflora*, *A. heterophylla*, *Blennosperma bakeri*, *Brassica*, *Calandrinia ciliata*, *Camissonia ovata*, *C. tanacetifolia*, *Geum macrophyllum*, *Lasthenia*, *Lomatium*, *Wyethia*.

*Andrena (Parandrena) cuneilabris* Viereck, 1926. Calif. Acad. Sci., Proc. (4) 15: 400. ♀.

Taxonomy: Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 64-67, figs. 1, 7-8, 56, 59, 70, 81-82, map 2 (redescription).

Biology: MacSwain and Bohart, 1946. Pan-Pacific Ent. 23: 30 (parasite). —Camras and Hurd, 1957. Calif. Ins. Survey, Bul. 6: 39 (parasite). —Linsley and MacSwain, 1959. Calif. Univ. Pubs. Ent. 16: 2-31, figs. 4, 6 (floral relationships, parasites). —Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 34, 66-67 (floral relationships, parasites).

**cyanosoma** (Cockerell). Calif.; Mexico (Baja California). Pollen: Collects pollen exclusively from the flowers of *Camissonia* including *C. bistorta*, *C. campestris*, *C. cheiranthifolia*, *suffruticosa*, *C. dentata*, *C. sierrae sierrae*, *C. spiralis*, but visits these and other flowers for nectar including *Cryptantha intermedia*, *Lasthenia aristata*, *L. coronaria*, *Rhus trilobata*, *Salix*.

*Diandrena cyanosoma* Cockerell, 1916. Pomona Jour. Ent. Zool. 8: 49. ♀, ♂.

*Andrena (Parandrena) austrocalifornica* Viereck, 1917. Acad. Nat. Sci. Phila., Proc. 68: 587. ♀.

Taxonomy: Linsley and MacSwain, 1961. Pan-Pacific Ent. 37: 36 (synonymy). —Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 99-102, figs. 1, 35-36, 56, 65, 77, map 9 (redescription).

Biology: Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 101 (floral relationships). —Linsley, MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 71: 23-24, fig. 10 (floral relationships).

**eothina** Linsley and MacSwain. Calif. (Merced County to Ventura County). Pollen: Collects pollen principally from *Camissonia campestris* and *C. sierrae sierrae* and also from *C. boothii decorticans*, *C. contorta*, *C. graciliflora*, but visits these and other flowers for nectar including *Agoseris heterophylla*, *Amsinckia*, *Encelia virginienensis actoni*, *Lasthenia chrysostoma*, *Layia*, *Monolopia lanceolata*, *Tropidocarpum gracile*.  
*Andrena (Diandrena) eothina* Linsley and MacSwain, 1961. Pan-Pacific Ent. 37: 39. ♀, ♂.  
*Andrena (Diandrena) anatolis matutina* Linsley and MacSwain, 1961. Pan-Pacific Ent. 37: 38. ♀, ♂.

Taxonomy: Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 95-97, figs. 1, 31-32, 56, map 8 (redescription, synonymy).

Biology: Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 97 (floral relationships). —Linsley, MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 71: 22-23, fig. 9 (nest architecture, floral relationships).

**evoluta** Linsley and MacSwain. Wash., Idaho and Wyo., south to northeast. Calif., Nev. and northern Ariz. (Grand Canyon). Pollen: Collects pollen primarily from microseridine Compositae including *Agoseris glauca*, *A. g. var. monticola*, *Microseris nutans* and locally obtains pollen from some of the crepidine Compositae such as *Crepis occidentalis*, the onagraceous *Camissonia* including *C. pallida*, *C. tanacetifolia*, and the introduced weed *Taraxacum officinale*; visits other flowers for nectar including *Ranunculus californicus*.

*Andrena (Diandrena) evoluta* Linsley and MacSwain, 1961. Pan-Pacific Ent. 37: 33. ♀.

Taxonomy: Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 85-88, figs. 1, 23-24, 56, map 6 (redescription).

Biology: Linsley, MacSwain and Raven, 1963. Calif. Univ. Pubs. Ent. 33: 40-41 (floral relationships). —Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 88 (floral relationships).

**foxii** Cockerell. Calif. Pollen: Collects pollen exclusively from flowers of *Camissonia*, chiefly *C. campestris*, but also from *C. contorta*, *C. dentata parishii* and *C. pallida pallida* when *C. campestris* is seasonally or locally rare or absent; visits these and other flowers for nectar including *Coreopsis californica*, *Cryptantha*, *Hemizonia*, *Isomeris arborea*, *Lupinus*, *Malacothrix*.

*Andrena foxii* Cockerell, 1898. Amer. Ent. Soc., Trans. 25: 188. ♀, ♂.

Taxonomy: Linsley and MacSwain, 1961. Pan-Pacific Ent. 37: 130 (subgeneric position). —Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 67-69, figs. 1, 9-10, 56, 60, 71, 87, map 2 (redescription).

Biology: Linsley and MacSwain, 1956. Pan-Pacific Ent. 32: 120-121 (floral relationships). —Linsley, MacSwain and Raven, 1964. Calif. Univ. Pubs. Ent. 33: 75 (floral relationships). —Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 69 (floral relationships). —Linsley, MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 18-20, 48-49, fig. 7, pl. 1 (floral relationships).

**gnaphalii** (Cockerell). South. Calif. (Catalina Island and Transverse and Peninsular Ranges). Pollen: Collects pollen apparently only from early morning opening flowers of *Agoseris* including *A. heterophylla*, *A. retrorsa*, but visits these and other flowers for nectar including *Anisocoma acaulis*, *Ceanothus integerrimus*, *Descourainia sophia*, *Gnaphalium bicolor*, *Lasthenia chrysostoma*, *Potentilla*, *Sisymbrium*, *Sonchus oleraceus*.

*Diandrena gnaphalii* Cockerell, 1938. Ann. and Mag. Nat. Hist. (11) 2: 148. ♂.

Taxonomy: Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 91-93, figs. 1, 27-28, 56, map. 13 (redescription).

Biology: Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 92-93 (floral relationships).

**lewisorum** Thorp. Calif. Pollen: Collects pollen from flowers of the genus *Clarkia* including *C. breveri*, *C. concinna*, *C. cylindrica*, *C. douglasiana*, *C. dudleyana*, *C. imbricata*, *C. purpurea*, *C. speciosa*, *C. unguiculata*, *C. williamsonii*, *C. xantiana*, but visits these and other flowers for nectar including *Baccharis*, *Cryptantha flaccida*, *Datura*, *Eriogonum fasciculatum*, *Hemizonia kelloggii*, *Lonicera interrupta*, *Mimulus*, *Ranunculus occidentalis*, *Rhamnus californica*.

*Andrena* (*Diandrena*) **lewisorum** Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 72, figs. 1, 13-14, 56, 61, 73, map 3. ♀, ♂.

Biology: Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 73-74 (floral relationships). — MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 70: 10-13, fig. 1 (floral relationships).

**macswaini** Linsley. Calif. (San Joaquin Valley). Pollen: Collects pollen from the flowers of *Camissonia campestris campestris* and *C. sierrae sierrae*, but visits these and other flowers for nectar including *Camissonia boothii decorticans*, *Erodium*, *Isomeris arborea*, *Malacothrix californica*.

*Andrena* (*Diandrena*) **macswaini** Linsley, 1960. Pan-Pacific Ent. 36: 97. ♀, ♂.

Taxonomy: Linsley and MacSwain, 1961. Pan-Pacific Ent. 37: 36 (tax characters). — Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 102-105, figs. 1, 37-38, 56, 66, 78, map 10 (redescription).

Biology: Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 105 (floral relationships). — Linsley, MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 71: 24-26, 50, pl. 2, fig. 11 (nest architecture, floral relationships).

**malacothricidis** Thorp. South. Calif.; Mexico (Baja California). Pollen: Collects pollen from stephanomerine Compositae, primarily *Malacothrix* including *M. californica*, *M. glabrata*, but visits other flowers including *Anisocoma acaulis*, *Calochortus*, *Camissonia campestris campestris*, *Convolvulus malacophyllus*, *Cryptantha*, *Descourainia sophia*, *Euphorbia albomarginata*, *Lasthenia chrysostoma*, *Linanthus aureus*, *Phacelia ciliata*.

*Andrena* (*Diandrena*) **malacothricidis** Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 113, figs. 1, 47-48, 56, map 11. ♀, ♂.

Biology: Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 115-116 (floral relationships).

**nothocalaidis** (Cockerell). B. C. to north. Calif., east to Wyo. and Colo. Pollen: Collects pollen from flowers of ligulate Compositae, primarily Microseridinae including *Agoseris glauca*, *Microseris nutans*, *Nothocalais cuspidata*, *Taraxacum officinale*, but visits other flowers for nectar including *Antennaria*, *Camissonia tanacetifolia tanacetifolia*, *Crepis occidentalis*, *Erigeron*, *Lepidium*, *Mimulus*.

*Diandrena nothocalaidis* Cockerell, 1905. Biol. Soc. Wash., Proc. 18: 183. ♀, ♂.

Taxonomy: Linsley and MacSwain, 1961. Pan-Pacific Ent. 37: 33-35 (tax. characters and status). — Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 105-107, figs. 1, 39-40, 56, map 11 (redescription).

Biology: Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 107 (floral relationships).

**olivacea** Viereck. Ariz. to south. Nev. and south. Calif. Pollen: Collects pollen almost exclusively from the flowers of stephanomerine Compositae, primarily *Anisocoma acaulis* and *Malacothrix* including *M. californica*, *M. glabrata*, but visits other flowers including *Agoseris heterophylla*, *Astragalus*, *Baileya*, *Calycoseris wrightii*, *Camissonia campestris*, *Coreopsis bigelovii*, *C. californica*, *Cryptantha barbiger*, *Encelia farinosa*, *Fallugia paradoxa*, *Geraea canescens*, *Hemizonia*, *Hyptis emoryi*, *Layia glandulosa*, *Phacelia*, *Rafinesquia neomexicana*. Predator: *Lestomyia* sp.

*Andrena* (*Parandrena*) **olivacea** Viereck, 1916. Acad. Nat. Sci. Phila., Proc. 68: 590. ♀, ♂.

Taxonomy: Linsley and MacSwain, 1961. Pan-Pacific Ent. 37: 35 (tax. characters). — Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 88-91, figs. 1, 25-26, 56, 64, 76, map 7 (redescription).

Biology: Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 91 (floral relationships).

**parachalybea** Viereck. South. Calif.; Mexico (Baja California). Pollen: Collects pollen from *Camissonia* including *C. bistorta*, *C. campestris campestris*, *C. cheiranthifolia suffruticosa*, *C. dentata*, *C. pallida pallida*, but visits these and other flowers for nectar including *Agoseris heterophylla*, *Astragalus*, *Baccharis viminea*, *Ceanothus crassifolius*, *Coreopsis bigelovii*, *C. californica*, *Cryptantha intermedia*, *Descourainia sophia*, *Erodium cicutarium*, *Haplopappus linearifolius*, *Eriophyllum confertiflorum*, *Lasthenia*, *Layia glandulosa*, *L. platyglossa campestris*, *Lomatium dasycarpum*, *Monolopia lanceolata*, *Plagiobothrys californicus*, *Rhus trilobata*, *Salix laevigata*, *S. lasiolepis*, *Sisymbrium irio*, *Tamarix*.

*Andrena* (*Parandrena*) *parachalybea* Viereck, 1917. Amer. Ent. Soc., Trans. 43: 391. ♀.

Taxonomy: Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 61-63, figs. 1, 5-6, 56, map 1 (redescription).

Biology: Linsley, MacSwain and Raven, 1964. Calif. Univ. Pubs. Ent. 33: 74-75 (floral relationships). — Linsley, MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 71: 17-18, 48, fig. 6 (floral relationships).

**puthua** (Cockerell). Calif.; Mexico (Baja California). Parasite: *Stylops* sp. Pollen: Collects pollen from *Lasthenia* including *L. aristata*, *L. chrysostoma*, *L. coronaria*, *L. debilis*, *L. gracilis*, *L. minor*, *L. tenella*, but visits these and other flowers for nectar including *Calandrinia ciliata*, *Chaenactis glabriuscula*, *Cryptantha*, *Eschscholzia californica*, *Layia platyglossa*, *Rhamnus crocea*.

*Diandrena puthua* Cockerell, 1910. Ann. and Mag. Nat. Hist. (8) 5: 24. ♂ (♀ misdet.).

*Diandrena beatula* Cockerell, 1916. Pomona Jour. Ent. Zool. 8: 48. ♀.

*Diandrena clariventris* Cockerell, 1916. Pomona Jour. Ent. Zool. 8: 50. ♂.

*Diandrena sanctorum* Cockerell, 1941. San Diego Soc. Nat. Hist., Trans. 9: 346. ♀.

Taxonomy: Timberlake, 1951. In Linsley In Muesebeck, Krombein and Townes, U. S. Dept. Agr., Agr. Monog. 2: 1078 (synonymy). — Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 74-78, figs. 1, 15-16, 56, map 4 (redescription, synonymy).

Biology: Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 34, 77 (floral relationships, parasite).

**sperryi** (Cockerell). Calif. Pollen: Collects pollen from the flowers of *Camissonia* including *C. campestris*, *C. clavaeformis*, *C. pallida pallida*, but visits these and other flowers for nectar including *Anisocoma acaulis*, *Coreopsis californica*, *C. bigelovii*, *Malacothrix glabrata*. Predator: *Lestomyia* sp.

*Diandrena sperryi* Cockerell, 1937. Amer. Mus. Novitates 948: 14. ♀.

Taxonomy: Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 69-72, figs. 1, 11-12, 56, 72, map 3 (redescription).

Biology: Linsley, MacSwain and Thorp, 1964. Calif. Univ. Pubs. Ent. 33: 74, table 3 (floral relationships). — Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 33, 72 (floral relationships, predator). — Linsley, MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 71: 20, 49, fig. 8 (floral relationships).

**subapasta** Thorp. Calif. Pollen: Apparently collects pollen primarily from *Arenaria californica*, but visits other flowers including *Lasthenia*, *Orthocarpus erianthus*.

*Andrena* (*Diandrena*) *subapasta* Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 120, figs. 1, 53-54, 56, map 13. ♀, ♂.

**subchalybea** Viereck. Calif.; Mexico (Baja California). Parasite: *Dalmanella picta* Will. Pollen: Collects pollen primarily from ligulate Compositae, especially *Agoseris heterophylla*; visits flowers of *Amsinckia*, *Brassica*, *Camissonia campestris campestris*, *Coreopsis californica*, *Crepis vesicaria*, *Descourainia sophia*, *Erodium*, *Euphorbia albomarginata*, *Haplopappus linearifolius*, *Hesperochiron californicus*, *Lasthenia chrysostoma*, *Layia chrysanthemoides*, *Layia platyglossa*, *Linnanthes douglasii*, *Madia gracilis*, *Malacothrix*, *Microseris douglasii*, *M. linearifolia*, *Mimulus*, *Monolopia lanceolata*, *Phacelia ciliata*, *Platystemon californicus*, *Ranunculus californicus*, *Sisymbrium*, *Sonchus oleraceus*.

*Andrena* (*Parandrena*) *subchalybea* Viereck, 1916. Acad. Nat. Sci. Phila., Proc. 68: 593. ♀.

Taxonomy: Linsley and MacSwain, 1961. Pan-Pacific Ent. 37: 32 (tax. status). — Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 111-113, figs. 1, 45-46, 56, 67, 79, 83-84, map 12 (redescription).

Biology: Bohart, 1938. Pan-Pacific Ent. 14: 132 (parasite). —Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 34, 113 (floral relationships, parasite).

**submoesta** Viereck. Calif. Parasite: *Stylops* sp. Pollen: Collects pollen from the flowers of *Lasthenia* including *L. chrysostoma*, *L. coronaria*, *L. gracilis*, *L. minor*, *L. tenella*, but visits these and other flowers for nectar including *Haplopappus*, *Hypochoeris radicata*, *Layia*, *Monolopia lanceolata*, *Tamarix*.

*Andrena* (*Parandrena*) *submoesta* Viereck, 1916. Acad. Nat. Sci. Phila., Proc. 68: 594. ♀.  
*Diandrena marinensis* Cockerell, 1936. Pan-Pacific Ent. 12: 153. ♂.

Taxonomy: Timberlake, 1951. In Linsley, In Muesebeck, Krombein and Townes, U. S. Dept. Agr., Agr. Monog. 2: 1082 (synonymy). —Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 78-81, figs. 1, 17-18, 56, 62, 74, map 5 (redescription).

Biology: Thorp, 1969. Calif Univ. Pubs. Ent. 52: 34, 79-80 (floral relationships, parasite).

#### Genus ANDRENA Subgenus EREMANDRENA LaBerge

*Andrena* subg. *Eremandrena* LaBerge, 1964. Nebr. Univ. State Mus., Bul. 4: 295.

Type-species: *Pterandrena pallidiscopa* Viereck. Monotypic and orig. desig.

Taxonomy: LaBerge, 1964. Nebr. Univ. State Mus., Bul. 4: 283, 293, 295-296 (tax. characters).

**pallidiscopa pallidiscopa** (Viereck). Calif., Oreg., Colo. Parasite: *Myopa rubida* (Bigot). Pollen: Unknown, but visits flowers of *Lomatium*, *Sanicula*.

*Pterandrena pallidiscopa* Viereck, 1904. Canad. Ent. 36: 227. ♀.

*Pterandrena nudimedicornis* Viereck, 1904. Canad. Ent. 36: 227. ♂.

Taxonomy: Timberlake and Cockerell, 1933. Pan-Pacific Ent. 9: 28 (tax. characters).

Biology: Bohart, 1941. Pan-Pacific Ent. 17: 95 (parasite).

**pallidiscopa trifasciata** Timberlake and Cockerell. South. Calif. Parasite: *Myopa rubida* (Bigot). Pollen: Unknown, but visits flowers of *Calandrinia menziesii*, *Lasthenia chrysostoma*, *Lomatium dasycarpum*, *L. utriculatum*, *Rhus trilobata*, *Sanicula bipinnatifida*.

*Andrena pallidiscopa trifasciata* Timberlake and Cockerell, 1933. Pan-Pacific Ent. 9: 28. ♀.

#### Genus ANDRENA Subgenus EUANDRENA Hedicke

*Andrena* subg. *Euandrena* Hedicke, 1933. Berlin Zool. Mus., Mitt. 19: 212.

Type-species: *Andrena bicolor* Fabricius. Orig. desig.

*Andrena* subg. *Xanthandrena* Lanham, 1949. Calif. Univ. Pubs. Ent. 8: 218.

Type-species: *Andrena auricoma* Smith. Orig. desig.

*Andrena* subg. *Geandrena* LaBerge, 1964. Nebr. Univ. State Mus., Bul. 4: 313.

Type-species: *Andrena caerulea* Smith. Orig. desig.

Revision: LaBerge and Ribble, 1975. Amer. Ent. Soc., Trans. 101: 371-446, 74 figs. (N. Amer. spp.).

Taxonomy: LaBerge, 1964. Nebr. Univ. State Mus., Bul. 4: 309 (tax. characters, as *Xanthandrena*). —LaBerge, 1977. Amer. Ent. Soc., Trans. 103: 107-135, figs. (revised key to included spp., synonymy; received too late for inclusion in this catalog).

**algida** Smith. N. S. to Alta. and N. W. T., south to N. J., N. Y., Mich., Minn., S. Dak., N. Mex. and Ariz. Pollen: Apparently polylectic with some preference for the flowers of *Salix* including *S. brachycarpae*, but visits other flowers including *Cornus mas*, *Fragaria*, *Pulsatilla hirsutissima*, *Ranunculus testiculatus*, *Ribes vallicola*, *Taraxacum officinale*, *Thlaspi arvense*.

*Andrena algida* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 116. ♀, ♂.

*Andrena fragiliformis* Cockerell, 1906. Amer. Mus. Nat. Hist., Bul. 22: 435. ♀.

*Andrena fernaldiella* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 34. ♂.

*Andrena brachycarpae* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 55. ♀.

*Andrena* (*Andrena*) *fuscisignata* Viereck, 1917. Amer. Ent. Soc., Trans. 45: 379. ♀, ♂.

*Andrena* (*Andrena*) *albisigna* Viereck, 1922. Boston Soc. Nat. Hist., Occas. Papers 5: 38. ♀.

Taxonomy: Morice and Cockerell, 1901. *Canad. Ent.* 33: 150 (type). —Cockerell, 1906. *Psyche* 13: 7. ♀ (type). —Atwood, 1934. *Canad. Jour. Res.* 10: 207, 209, figs. ♀, ♂. —Mitchell, 1960. *N. C. Agr. Expt. Sta. Tech. Bul.* 141: 218-219, figs. 42-44 (redescription). —LaBerge and Ribble, 1975. *Amer. Ent. Soc., Trans.* 101: 396-399, figs. 3, 25-29 (redescription, synonymy).

**astragali** Viereck and Cockerell. Wash. to Calif. east to Utah, Wyo. and Nebr. Pollen:

Unknown, although frequently collected from the flowers of *Zygadenus fremontii*, but visits other flowers including *Agoseris glauca*, *Allium haematochton*, *Astragalus*, *Cardaria draba* var. *repens*, *Chamaebatia foliolosa*, *Cornus*, *Eriogonum*, *Oxytropis*, *Salix*, *Taraxacum officinale*, *Tofieldia occidentalis*.

*Andrena astragali* Viereck and Cockerell, 1914. *U. S. Natl. Mus., Proc.* 48: 46. ♀.

*Andrena zygadeni* Cockerell, 1932. *Pan-Pacific Ent.* 8: 174. ♀, ♂.

**auricoma** Smith. B. C. to south. Calif., east to Wyo., Colo. and south to Ariz. Pollen: Polylectic, most frequently collected at the flowers of *Ranunculus*, *Descurainia*, *Salix* and *Potentilla* in that order, but visits a great variety of flowers including *Baccharis*, *Barbarea orthoceras*, *Brassica nigra*, *Camissonia*, *Ceanothus*, *Chamaebatia foliolosa*, *Cornus californicus*, *Crataegus*, *Cryptantha intermedia*, *C. muricata*, *Daucus carota*, *Dendromecon rigida*, *Descurainia sophia*, *Eriodictyon californicum*, *Eriogonum marifolium*, *Eriophyllum obovatum*, *Euphorbia albomarginata*, *Fragaria californica*, *Fritillaria lanceolata*, *Geranium*, *Gilia capitata*, *Hackelia floribunda*, *H. patens*, *Lasthenia chrysostoma*, *Layia*, *Linanthus montanus*, *Lomatium dissectum*, *L. triternatum*, *Lupinus bicolor*, *Malacothamnus arcuatus*, *Malus*, *Mentzelia*, *Mirabilis laevis*, *Montia perfoliata*, *Nemophila integrifolia*, *Orthocarpus erianthus*, *Phacelia cicutaria*, *P. distans*, *P. hispida*, *P. ramosissima*, *P. tanacetifolia*, *Plagiobothrys californicus*, *P. tenellus*, *Potentilla glandulosa*, *Prunus ilicifolia*, *P. melanocarpa*, *P. subcordata*, *Pyraecantha*, *Quercus agrifolia*, *Ranunculus californicus*, *R. occidentalis*, *Rhamnus crocea*, *Rhus diversiloba*, *R. trilobata*, *Rubus ursinus*, *Salix laevigata*, *S. lasiolepis*, *Salvia columbariae*, *Sanicula crassicaula*, *S. nevadensis*, *Saxifraga integrifolia*, *Scrophularia californica*, *Sedum*, *Sisymbrium irio*, *Sisyrinchium bellum*, *Stachys*, *Stenotopsis linearifolius*, *Tamarix gallica*, *Taraxacum officinale*, *Thysanocarpus curvipes*.

*Andrena auricoma* Smith, 1879. *Descr. New Species Hym. Brit. Mus.*, p. 56. ♂.

Taxonomy: Morice and Cockerell, 1901. *Canad. Ent.* 33: 155. ♂ (notes on type). —Cockerell, 1906. *Psyche* 13: 8 (notes on type). —Viereck, 1904. *Canad. Ent.* 36: 193. ♀, ♂ (key).

—Lanham, 1941. *Ent. Soc. Amer., Ann.* 34: 706, 708. ♀, ♂ (key).

**caerulea** Smith. B. C. (Vancouver Is.) to Calif., east to Idaho, Nev., and Utah (Mendon).

Parasite: *Myopa rubida* (Bigot), *Myopa* sp., *Nomada obscurella* Fowler, *N. opacella* Timberlake, *Stylops pacifica* Bohart. Pollen: Oligolege of *Ranunculus*, especially *R. californicus*, but visits other species of *Ranunculus* including *R. alsinaefolius*, *R. occidentalis*, *R. o. dissectus*, *R. orthorhynchus* as well as the flowers of *Arctostaphylos*, *Astragalus*, *Brassica*, *Ceanothus* including *C. cuneatus*, *Cryptantha*, *Fagus*, *Gilia*, *Ipomoea*, *Lasthenia chrysostoma*, *Lomatium*, *Lysichiton kamtschaticense*, *Mimulus*, *Nemophila*, *Phacelia*, *Polygonum bistortoides*, *Rhamnus*, *Ribes*, *Rubus*, *Salix*, *Senecio*, *Sanicula nevadensis*, *Sisyrinchium bellum*, *Taraxacum officinale*. Predator: *Xysticus*.

*Andrena caerulea* Smith, 1879. *Descr. New Species Hym. Brit. Mus.*, p. 55. ♀.

*Andrena caerulea* var. *terrata* Cockerell, 1898. *Entomologist* 31: 89. ♀.

*Pterandrena erigenoides* Viereck, 1904. *Canad. Ent.* 36: 227. ♀.

*Pterandrena crypta* Viereck, 1904. *Canad. Ent.* 36: 227. ♀.

*Pterandrena acripta* Viereck, 1904. *Canad. Ent.* 36: 227. ♀.

*Pterandrena complexa* Viereck, 1904. *Canad. Ent.* 36: 227. ♀.

*Andrena (Ptilandrena) francisca* Viereck, 1917. *Acad. Nat. Sci. Phila., Proc.* 68: 595. ♀.

*Andrena supervirens* Cockerell, 1924. *Pan-Pacific Ent.* 1: 64. ♀.

*Andrena supervirens* var. *aurescens* Cockerell, 1924. *Pan-Pacific Ent.* 1: 64. ♀.

*Andrena (Andrena) innominata* Viereck, 1926. *Calif. Acad. Sci., Proc.* (4) 15: 404. ♂.

*Andrena (Ptilandrena) tristis* Linsley, 1951. *In* Muesebeck, Krombein and Townes, *U. S.*

Dept. Agr., *Agr. Monog.* 2: 1062. *Nomen nudum*.

**Taxonomy:** Morice and Cockerell, 1901. *Canad. Ent.* 33: 154 (type). —Cockerell, 1906. *Psyche* 13: 9 (type). —Viereck, 1904. *Canad. Ent.* 36: 227. ♀ (key, as *terrile*). —Cockerell, 1932. *Canad. Ent.* 64: 287. ♀ (as *complexa*). —Michener, 1953. *Kans. Univ. Sci. Bul.* 35: 1034, figs. 82, 83, 85 (larva, as *complexa*). —LaBerge and Ribble, 1975. *Amer. Ent. Soc., Trans.* 101: 406-415, figs. 6, 35-39 (redescription, synonymy).

**Biology:** Bohart, 1936. *Pan-Pacific Ent.* 12: 9 (parasite). —Bohart, 1941. *Pan-Pacific Ent.* 17: 95 (parasite). —Bohart, 1941. *Calif. Univ. Pubs. Ent.* 7: 91 (parasite). —MacSwain and Bohart, 1947. *Pan-Pacific Ent.* 23: 30 (parasite). —MacSwain, 1949. *Pan-Pacific Ent.* 25: 89-90 (parasite). —Linsley and MacSwain, 1955. *Wasmann Jour. Biol.* 13: 253 (parasite). —Linsley and MacSwain, 1957. *Calif. Univ. Pubs. Ent.* 11: 395 (parasite). —Linsley and MacSwain, 1959. *Calif. Univ. Pubs. Ent.* 16: 5-13, text figs. 1-5, plate figs. 1b, 3c and d (nest construction, life history, overwintering, emergence, behavior, sex ratio, mating, floral relationships, parasites).

**chlorura** Cockerell. Wash. to Calif., east to Utah and Airz.; Mexico (Baja California). Pollen: Polylectic, visits a wide variety of flowers including *Acer macrophyllum*, *Arbutus menziesii*, *Arctostaphylos bicolor*, *A. crustacea*, *A. drupacea*, *A. glandulosa*, *A. glauca*, *A. mariposa*, *A. patula*, *Berberis pinnata*, *Ceanothus arboreus*, *C. cordulatus*, *C. crassifolius*, *C. cuneatus*, *C. greggii*, *C. integerrimus*, *C. leucodermis*, *C. palmeri*, *C. soredatus*, *C. velutinus*, *C. verrucosa*, *Cercocarpus betulifolius*, *Claytonia spatulata*, *Cryptantha*, *Dentaria californica*, *Fragaria californica*, *Gilia*, *Lasthenia chrysostoma*, *Malus*, *Paeonia brownii*, *Petasites palmata*, *Prunus subcordata*, *Quercus*, *Ranunculus*, *Rhamnus californica*, *R. crocea*, *R. ilicifolia*, *Rhus integrifolia*, *R. ovata*, *R. trilobata*, *Ribes indecorum*, *Salix lasiolepis*, *Salvia mellifera*, *Tamarix*.  
*Andrena chlorura* Cockerell, 1916. *Pomona Jour. Ent. Zool.* 8: 48. ♀.  
*Andrena (Andrena) complicata* Viereck, 1916. *Acad. Nat. Sci. Phila., Proc.* 68: 554. ♀.  
*Andrena ablusula* Cockerell, 1936. *Pan-Pacific Ent.* 12: 135. ♀.  
*Andrena clementina* Timberlake, 1941. *South. Calif. Acad. Sci., Bul.* 39: 193. ♀.

**Taxonomy:** Timberlake, 1951. In Linsley, In Muesebeck, Krombein and Townes, U. S. Dept. Agr., *Agr. Monog.* 2: 1061 (synonymy). —LaBerge and Ribble, 1975. *Amer. Ent. Soc., Trans.* 101: 402-406, figs. 5, 30-34 (redescription, synonymy).

**dissimulans** Timberlake. Calif. Pollen: Evidently an oligolege of *Lasthenia* including *L. aristata*, *L. chrysostoma*, *L. gracilis*, *L. tenella*, but also visits the flowers of *Calandrinia menziesii*, *Salvia*.

*Andrena (Thysandrena) dissimulans* Timberlake, 1951. *U. S. Natl. Mus., Proc.* 101: 408. ♀, ♂.

*Andrena (Thysandrena) blandula* Timberlake, 1951. *U. S. Natl. Mus., Proc.* 101: 410. ♀.

**Taxonomy:** LaBerge and Ribble, 1975. *Amer. Ent. Soc., Trans.* 101: 426-429, figs. 3, 55-59 (redescription, synonymy).

**hamulata** LaBerge and Ribble. Calif. Pollen: Unknown, but visits flowers of *Salix*.

*Andrena (Euandrena) hamulata* LaBerge and Ribble, 1975. *Amer. Ent. Soc., Trans.* 101: 399, figs. 3, 20-24. ♀, ♂.

**lawrencei** Viereck and Cockerell. B. C. to Calif., east to Alta., Idaho, Wyo., Utah and Nebr.

Pollen: Unknown, but visits flowers of *Balsamorhiza sagittata*, *Carnaria draba*, *Helianthus nuttallii*, *Phlox hoodii*, *Silphium*, *Wyethia mollis*.

*Andrena lawrencei* Viereck and Cockerell, 1914. *U. S. Natl. Mus., Proc.* 48: 15. ♀.

*Andrena (Iomelissa) extensa* Viereck, 1924. *Canad. Ent.* 56: 240. ♀, ♂.

**Taxonomy:** Cockerell, 1932. *Canad. Ent.* 64: 286. ♀ (key, as *extensa*). —LaBerge and Ribble, 1975. *Amer. Ent. Soc., Trans.* 101: 386-390, figs. 3, 18-19 (redescription, synonymy).

**misella** Timberlake. Calif. Pollen: Unknown, but visits flowers of *Amsinckia eastwoodae*, *Anagallis arvensis*, *Brassica*, *Calandrinia ciliata*, *Lasthenia*, *Montia perfoliata*, *Phacelia*, *Ranunculus*.

*Andrena misella* Timberlake, 1951. *U. S. Natl. Mus., Proc.* 101: 410. ♀.

**nigrihirta** (Ashmead). Alaska and transcont. south. Canada, south to Calif., Nev., Utah, Colo., N. Dak., Minn., Wis., Ill., Mich., N. Y. and Conn. Pollen: Apparently polylectic, visits flowers of *Angelica*, *Dentaria californica*, *Eriogonum*, *Eriophyllum confertiflorum*,



- Erythronium grandiflorum*, *Fragaria*, *Fritillaria pumila*, *Lonicera*, *Lotus*, *Montia perfoliata*, *Petasites palmata*, *Pulsatilla hirsutissima*, *Ranunculus*, *Rhododendron occidentale*, *Rosa*, *Rubus*, *Smilacina stellata*, *Synthlipsis plantaginum*.  
*Cillissa nigrihirta* Ashmead, 1890. Colo. Biol. Assoc., Bul. 1: 6. ♂.  
*Andrena longihirtiscope* Viereck, 1904. Canad. Ent. 36: 191. ♀.  
*Andrena decussata* Viereck, 1904. Canad. Ent. 36: 193, 194. ♀, ♂.  
*Andrena decussatula* Viereck, 1904. Canad. Ent. 36: 193. ♀.  
*Andrena synthlipsis* Cockerell, 1906. Amer. Mus. Nat. Hist., Bul. 22: 436. ♀.  
*Andrena novae-angliae* Viereck, 1907. Ent. News 18: 283. ♀.  
*Andrena nivaloides* Graenicher, 1911. Pub. Mus. Milwaukee, Bul. 1: 235. ♀.  
*Andrena discolor* Viereck, 1916. Amer. Mus. Nat. Hist., Bul. 35: 370. ♀.  
*Andrena (Andrena) tumida* Viereck, 1922. Boston Soc. Nat. Hist., Occas. Papers 5: 35. ♀, ♂.  
*Andrena (Andrena) vancouverensis* Viereck, 1924. Canad. Ent. 56: 80. ♂.  
*Andrena (Andrena) nigrovaria* Viereck, 1924. Canad. Ent. 56: 237. ♀.  
*Andrena (Andrena) marina* Viereck, 1926. Calif. Acad. Sci., Proc. (4) 15: 405. ♂.  
*Andrena ripariella* Cockerell, 1936. Pan-Pacific Ent. 12: 148. ♂.  
*Andrena (Thysandrena) crenata* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 221, figs. 44, 51. ♂.

Taxonomy: Atwood, 1934. Canad. Jour. Res. 10: 207. ♀ (key, as *novaeangliae*). — Lanham, 1941. Ent. Soc. Amer., Ann. 34: 705. ♀, ♂ (key). — LaBerge and Ribble, 1975. Amer. Ent. Soc., Trans. 101: 380-386, figs. 2, 8-12 (redescription, synonymy).

**nigrocaerulea** Cockerell, B. C. to Calif., east to Wyo. and Colo. Parasite: *Stylops pacifica* Bohart. Pollen: Polylectic, visits a wide variety of flowers including *Allium*, *Arbutus menziesii*, *Arctostaphylos nevadensis*, *Arenaria kingii*, *Barbarea orthoceras*, *B. vulgaris*, *Berberis aquifolium*, *Brassica*, *Cakile edentula californica*, *Calyptidium umbellatum*, *Ceanothus integerrimus*, *Cercocarpus betuloides*, *Chamaebatia foliolosa*, *Cryptantha intermedia*, *Daucus carota*, *Descourainia sophia*, *Doronicum*, *Eriodictyon californicum*, *Eriogonum lobbii*, *E. marifolium*, *Erodium botrys*, *Erysimum asperum*, *Fragaria californica*, *Gilia capitata*, *G. multicaulis*, *G. tricolor*, *Hackelia patens*, *Hesperochiron californicus*, *Horkelia tillingii*, *Lappula*, *Linanthus androsaceus*, *L. parviflorus*, *Lithophragma affinis*, *Lomatium dissectum*, *Lonicera*, *Lotus*, *Mertensia*, *Microseris nutans*, *Mimulus guttatus*, *Montia perfoliata*, *M. sibirica*, *Nemophila integrifolia*, *N. spatulata*, *Oenothera*, *Penstemon cyananthus*, *Phacelia humilis*, *P. linearis*, *P. pusilla*, *P. tanacetifolia*, *Plectritis macrocera*, *Potentilla glandulosa*, *Prunus virginiana*, *P. subcordata*, *Pyracantha*, *Quercus agrifolia*, *Ranunculus californicus*, *Raphanus sativa*, *Rhamnus californicus*, *R. crocea*, *Rubus*, *Salix*, *Sanicula nevadensis*, *Senecio canus*, *S. integerrimus*, *Sisyrinchium bellum*, *Spraguea umbellata*, *Taraxacum officinale*, *T. vulgare*, *Trifolium repens*.

- Andrena nigrocaerulea* Cockerell, 1897. Entomologist 30: 309. ♀, ♂.  
*Andrena seattlensis* Viereck, 1904. Canad. Ent. 36: 191, 195. ♀, ♂.  
*Andrena epileuca* Cockerell, 1924. Pan-Pacific Ent. 1: 62. ♀, ♂.  
*Andrena lustrans* Cockerell, 1924. Pan-Pacific Ent. 1: 63. ♀.

Taxonomy: Cockerell, 1932. Canad. Ent. 64: 286 (key). — Cockerell, 1932. Canad. Ent. 64: 286. ♀ (variation, as *lustrans*). — Cockerell, 1932. Canad. Ent. 64: 286. ♀ (key, as *epileuca*). — LaBerge and Ribble, 1975. Amer. Ent. Soc., Trans. 101: 390-396, figs. 4, 13-17 (redescription, synonymy).

Biology: Linsley and MacSwain, 1957. Calif. Univ. Pubs. Ent. 11: 399 (stylopization). — Linsley and MacSwain, 1959. Calif. Univ. Pubs. Ent. 16: 19 (floral relationships, stylopization).

**penemisella** LaBerge and Ribble. Calif. and Oreg. (Cayuse and The Dalles). Pollen: Unknown, but visits flowers of *Calandrinia*, *Cryptantha*, *Erodium*, *Montia perfoliata*.  
*Andrena (Euandrena) penemisella* LaBerge and Ribble, 1975. Amer. Ent. Soc., Trans. 101: 422. ♀.

**suavis** Timberlake. Oreg. (Klamath Co.), Calif. Parasite: *Nomada obliquella* Timberlake, *N. opacellus* Timberlake, *Stylops pacifica* Bohart. Pollen: Oligolectic, apparently collects

pollen only from the flowers of *Ranunculus californicus*, but visits other flowers presumably for nectar including *Astragalus*, *Calandrinia menziesii*, *Ceanothus*, *Lasthenia chrysostoma*, *Lomatium utriculatum*, *Montia perfoliata*, *Oenothera ovata*, *Orthocarpus densiflorus*, *Platystemon californicus*, *Rhus trilobata*, *Wyethia angustifolia*. Predator: *Xysticus* sp.

*Andrena (Ptilandrena) suavis* Timberlake, 1938. Pan-Pacific Ent. 14: 24. ♀, ♂.

Biology: Bohart, 1941. Calif. Univ. Pubs. Ent. 7: 128 (parasite). — MacSwain, 1949. Pan-Pacific Ent. 25: 89 (stylopization). — Linsley and MacSwain, 1955. Wasmann Jour. Biol. 13: 253 (parasite). — Linsley and MacSwain, 1957. Calif. Univ. Pubs. Ent. 11: 395-422 (parasite, stylopization). — Linsley and MacSwain, 1959. Calif. Univ. Pubs. Ent. 16: 13-16, plate 3, figs. a and b (nest architecture, life history, overwintering, emergence, sex ratio, floral relationships, parasites, predator).

**subdepressa** Timberlake. Calif. Pollen: Unknown, but visits flowers of *Brassica*, *Dentaria californica*, *Ranunculus californicus*, *Salix lasiolepis*.

*Andrena (Thysandrena) subdepressa* Timberlake, 1951. U. S. Natl. Mus., Proc. 101: 407. ♀, ♂.

Biology: Linsley and MacSwain, 1959. Calif. Univ. Pubs. Ent. 16: 19 (floral relationships).

**venata** LaBerge and Ribble. Calif. (Sonora Pass). Pollen: Unknown, but visits flowers of *Ranunculus*.

*Andrena (Euandrena) venata* LaBerge and Ribble, 1975. Amer. Ent. Soc., Trans. 101: 429, figs. 60-64. ♀, ♂.

#### Genus ANDRENA Subgenus GEISSANDRENA LaBerge

*Andrena* subg. *Geissandrena* LaBerge and Ribble, 1972. Amer. Ent. Soc., Trans. 98: 302.

Type-species: *Andrena trevoris* Cockerell. Monotypic and orig. desig.

Revision: LaBerge and Ribble, 1972. Amer. Ent. Soc., Trans. 98: 302-307, figs. 1, 36-40.

**trevoris** Cockerell. B. C. and Alta., south to Calif., south to Idaho, Utah and ?Ariz. (Huachuca Mts. and Nogales). Pollen: Unknown, but visits flowers of *Aesculus*, *Cirsium*, *Lonicera*, *Rosa*, *Symphoricarpos*.

*Andrena trevoris* Cockerell, 1897. Entomologist 30: 306. ♂.

*Andrena semipolita* Viereck, 1904. Canad. Ent. 36: 192. ♀.

*Andrena ricardonis* Cockerell, 1916. Canad. Ent. 48: 272. ♂.

Taxonomy: Timberlake, 1951. U. S. Natl. Mus., Proc. 101: 380. ♀.

#### Genus ANDRENA Subgenus GONANDRENA Viereck

*Andrena* subg. *Gonandrena* Viereck, 1917. Amer. Ent. Soc., Trans. 43: 390.

Type-species: *Andrena (Gonandrena) persimulata* Viereck. Monotypic.

*Andrena* subg. *Tropandrena* Viereck, 1924. Canad. Ent. 56: 21.

Type-species: *Andrena fragilis* Smith. Monotypic and orig. desig.

Revision: LaBerge and Ribble, 1972. Amer. Ent. Soc., Trans. 98: 271-302, figs. 1-4, 10-35 (N. Amer. spp.).

Taxonomy: Lanham, 1949. Calif. Univ. Pubs. Ent. 8: 210 (tax. characters). — LaBerge, 1964. Nebr. Univ. State Mus., Bul. 4: 302 (tax. characters).

**avulsa** LaBerge and Ribble. Tex. Pollen: Unknown, but visits flowers of *Parkinsonia*, *Phacelia*.

*Andrena (Gonandrena) avulsa* LaBerge and Ribble, 1972. Amer. Ent. Soc., Trans. 98: 298, figs. 4, 26-30. ♀, ♂.

**flocculosa** LaBerge and Ribble. Wash., Calif. (Gold Lake and Meadow Valley), Nev. (Lamoille).

*Andrena (Gonandrena) flocculosa* LaBerge and Ribble, 1972. Amer. Ent. Soc., Trans. 98: 296, figs. 4, 24-25. ♀, ♂.

**fragilis** Smith. Que. to Ga., west to Wis., Iowa and Kans. Pollen: Apparently an oligolege of *Cornus* including *C. amomum*, *C. paniculata*, but visits other flowers including *Aruncus*,

*Castanea pumila*, *Ceanothus*, *Cicuta maculata*, *Cirsium*, *Hydrangea*, *Pastinaca sativa*, *Ptelea*, *Salix*, *Sida*, *Trifolium*, *Viburnum dentatum*, *V. molle*.

*Andrena fragilis* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 115. ♂.

*Andrena lateiceps* Provancher, 1888. Addit. Corr. Fauna Ent. Canada, Hym., p. 307. ♂. Preocc.

*Andrena provancheri* Dalla Torre, 1896. Cat. Hym. v. 10, p. 147. N. name.

**Taxonomy:** Morice and Cockerell, 1901. Canad. Ent. 33: 149 (type of *fragilis*). —Cockerell, 1906. Psyche 13: 7 (type of *fragilis*). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 231-232, figs. 46-49, table 6 (redescription). —LaBerge and Ribble, 1972. Amer. Ent. Soc., Trans. 98: 278-284, figs. 2, 10-14 (redescription, synonymy).

**integra** Smith. Que. and Ont., south to N. C., west to Minn. and Kans. Pollen: Possibly an oligolege of *Cornus* including *C. stolonifera*, but visits other flowers including *Achillea*, *Aruncus*, *Barbarea vulgaris*, *Crataegus*, *Cryptotaenia*, *Melilotus alba*, *M. officinalis*, *Pastinaca*, *Ptelea*, *Rhus*, *Viburnum*, *Vitis*.

*Andrena integra* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 114. ♀.

*Andrena lineata* Provancher, 1888. Addit. Corr. Faune Ent. Canada, Hym., p. 309. ♀.

*Andrena (Gonandrena) lucifera* Cockerell, 1932. Canad. Ent. 64: 155. ♀.

**Taxonomy:** Morice and Cockerell, 1901. Canad. Ent. 33: 124 (type of *integra*). —Cockerell, 1906. Psyche 13: 6 (type of *integra*). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 232-233, figs. 46-49, table 6 (redescription). —LaBerge and Ribble, 1972. Amer. Ent. Soc., Trans. 98: 284-287, figs. 2, 15-19 (redescription, synonymy).

**nigrifrons** (Cresson). Ont. and N. H. south to N. C., west to Man., Minn., Nebr., Kans. and Tex.

Pollen: Possibly polylectic, although seems to prefer pollen of *Cornus* including *C. asperifolia*, *C. paniculata*, *C. racemosa*, *C. sericea*, *C. stolonifera*, but visits other flowers including *Achillea*, *Barbarea vulgaris*, *Ceanothus americanus*, *Cryptotaenia canadensis*, *Erigeron philadelphicus*, *Hieraceum*, *Lotus corniculatus*, *Melilotus alba*, *M. officinalis*, *Ptelea trifoliata*, *Rhus glabra*, *Rubus*, *Sambucus americanus*, *Spiraea aruncus*, *S. vanhouttei*, *Taraxacum*, *Toxicodendron*, *Viburnum dentatum*, *Zizia aurea*.

*Panurgus nigrifrons* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 62. ♂.

*Andrena platyparia* Robertson, 1895. Amer. Ent. Soc., Trans. 22: 119. ♀, ♂.

*Andrena (Andrena) barbarica* Viereck, 1917. Amer. Ent. Soc., Trans. 43: 369. ♀.

*Andrena (Gonandrena) monroensis* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 233. ♀.

**Taxonomy:** LaBerge and Ribble, 1972. Amer. Ent. Soc., Trans. 98: 287-292, figs. 3, 20-21 (redescription, synonymy).

**persimulata** Viereck. N. S. to N. W. T. and Alta., south to Conn., N. Y., Mich., Wis., Minn., Nebr., Colo. and Utah. Pollen: Possibly an oligolege of *Cornus* including *C. asperifolia*, *C. stolonifera*, but visits other flowers including *Angelica atropurpurea*, *Crataegus*, *Deutzia gracilis*, *Fragaria*, *Lomatium dissectum*, *Polygonum convolvulus*, *Prunus spiraea*, *Taraxacum officinalis*, *Viburnum*.

*Andrena (Gonandrena) persimulata* Viereck, 1917. Amer. Ent. Soc., Trans. 43: 390. ♀.

**Taxonomy:** Atwood, 1934. Canad. Jour. Res. 10: 206, 209. ♀, ♂ (key). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 235-236, figs. 45-46, 48, table 6 (redescription). —LaBerge and Ribble, 1972. Amer. Ent. Soc., Trans. 98: 292-296, figs. 4, 22-23 (redescription).

### Genus ANDRENA Subgenus HESPERANDRENA Timberlake

*Andrena* subg. *Hesperandrena* Timberlake, 1949. In Lanham, Calif. Univ. Pubs. Ent. 8: 208.

Type-species: *Andrena escondida* Cockerell. Orig. desig.

**Taxonomy:** LaBerge, 1964. Nebr. Univ. State Mus., Bul. 4: 283, 293, 301 (tax. characters).

**baeriae** Timberlake. Calif. Pollen: Apparently an oligolege of the flowers of *Lasthenia* including *L. aristata*, *L. chrysostoma*, *L. gracilis*, but visits other flowers including *Eriophyllum confertiflorum*, *Layia platyglossa*, *Lessingia germanorum*, *Senecio californica*.

*Andrena baeriae* Timberlake, 1941. South. Calif. Acad. Sci., Bul. 39: 194. ♀, ♂.

- duboisii** Timberlake. North. Calif. Pollen: Unknown, but visits flowers of *Lasthenia chrysostoma*, *Layia platyglossa*.  
*Andrena (Hesperandrena) duboisii* Timberlake, 1951. U. S. Natl. Mus., Proc. 101: 390. ♀, ♂.
- escondida** Cockerell, South. Calif.; Mexico (Baja California). Pollen: Unknown, but visits flowers of *Encelia*, *Layia platyglossa*.  
*Andrena escondida* Cockerell, 1938. Ann. and Mag. Nat. Hist. (11) 2: 146. ♂.
- lativentris** Timberlake. Calif. Pollen: Unknown, but visits flowers of *Amsinckia intermedia*, *Coreopsis maritima*, *Hemizonia pungens*, *Lasthenia chrysostoma*, *L. gracilis*, *L. tenella*, *Layia platyglossa*.  
*Andrena (Hesperandrena) lativentris* Timberlake, 1951. U. S. Natl. Mus., Proc. 101: 388. ♀, ♂.
- limnanthis** Timberlake. Calif. Pollen: Possibly an oligoecole of *Limnanthes* including *L. douglasii*, but visits other flowers including *Chamaebatia foliolosa*, *Layia platyglossa*, *Raphanus sativus*.  
*Andrena (Hesperandrena) limnanthis* Timberlake, 1951. U. S. Natl. Mus., Proc. 101: 387. ♀, ♂.

#### Genus ANDRENA Subgenus IOMELISSA Robertson

- Iomelissa* Robertson, 1900. Acad. Sci. St. Louis, Trans. 10: 50.  
 Type-species: *Andrena violae* Robertson. Monotypic.
- Taxonomy: Lanham, 1949. Calif. Univ. Pubs. Ent. 8: 207 (tax. characters). — LaBerge, 1964. Nebr. Univ. State Mus., Bul. 4: 284, 288, 300 (tax. characters).
- violae** Robertson. N. Y. to N. C., west to Ill. and Colo. Pollen: Obtains pollen solely from the flowers of *Viola*, but visits other flowers for nectar including *Cardamine*, *Ellisia*, *Oxalis*, *Potentilla*.  
*Andrena violae* Robertson, 1891. Amer. Ent. Soc., Trans. 18: 53. ♀, ♂.  
*Andrena davisi* Viereck, 1907. Ent. News 18: 283. ♀.
- Taxonomy: Cockerell, 1914. Ann. and Mag. Nat. Hist. (8) 14: 10. ♀ (key). — Lanham, 1941. Ent. Soc. Amer., Ann. 34: 706, 707. ♀, ♂ (key). — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 252-254, figs. 54-56 (redescription, synonymy).

#### Genus ANDRENA Subgenus LARANDRENA LaBerge

- Andrena* subg. *Larandrena* LaBerge, 1964. Nebr. Univ. State Mus., Bul. 4: 304.  
 Type-species: *Andrena miserabilis* Cresson. Orig. desig.
- Revision: Ribble, 1967. Nebr. Univ. State Mus., Bul. 6: 27-42, figs. 1-5, 1 table, 1 map.
- Taxonomy: LaBerge and Ribble, 1972. Amer. Ent. Soc., Trans. 98: 308 (tax. status).
- miserabilis** Cresson. Transcont. south. Canada and U. S., south to Fla., Ala., Miss., Tex., N. Mex., Utah and Calif.; Mexico (Tamaulipas). Parasite: *Leucophora obtusa* (Zett.), *Nomada* sp., *Stylops bipunctata* Pierce, *S. oklahomae* Pierce. Pollen: Polylectic, principally obtains pollen from the flowers of Rosaceae and Salicaceae; visitation records include *Amelanchier*, *Antennaria*, *Arabis*, *Aronia*, *Berberis*, *Brassica*, *Capsella*, *Cardamine*, *Ceanothus*, *Cercis*, *Cercocarpus*, *Claytonia*, *Comandra*, *Convolvulus*, *Courus*, *Crataegus*, *Cydonia*, *Dentaria*, *Erigenia*, *Exochorda*, *Fragaria*, *Hepatica*, *Heracleum*, *Ilex*, *Isopyrum*, *Malus*, *Prunus*, *Ptelea*, *Pyracantha*, *Pyrus*, *Ranunculus*, *Rhamnus*, *Rhus*, *Rubus*, *Salix*, *Solidago*, *Sorbaria*, *Spiraea*, *Stachys*, *Staphylea*, *Stellaria*, *Taraxacum*, *Viburnum*, *Viola*, *Zanthoxylum*.  
*Andrena clypeata* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 115. ♀. Preocc.  
*Andrena miserabilis* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 259. ♀ (♂ misdet.).  
*Andrena bipunctata* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 259. ♂.  
*Andrena flavoclypeata* Smith, 1879. Descr. New Species Hym. Brit. Mus., p. 54. ♂.  
*Andrena scutellaris* Robertson, 1893. Amer. Ent. Soc., Trans. 10: 148. ♀. Preocc.  
*Anthrena clypeolata* Dalla Torre, 1896. Cat. Hym., v. 10, p. 133. N. name.  
*Anthrena scutellata* Dalla Torre, 1896. Cat. Hym., v. 10, p. 151. N. name.  
*Andrena pennsylvanicola* Viereck, 1907. Ent. News 18: 284. ♀.  
*Andrena pronitens* Cockerell, 1930. Ann. and Mag. Nat. Hist. (10) 5: 114. ♀.

**Taxonomy:** Morice and Cockerell, 1901. *Canad. Ent.* 33: 124, 152 (types of *clypeata*, *flavoclypeata*). —Robertson, 1902. *Amer. Ent. Soc., Trans.* 28: 193. ♀, ♂ (key).  
 —Cockerell, 1906. *Psyche* 13: 9, 36, (types of *clypeata*, *flavoclypeata*). —Atwood, 1934. *Canad. Jour. Res.* 10 (2): 208, 209, fig. ♀, ♂ (key). —Lanham and Timberlake, 1951. *In* Muesebeck, Krombein and Townes, U. S. Dept. Agr., Agr. Monog. 2: 1058 (synonymy).  
 —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 95, 160, fig. 29, table 4 (redescription). —Ribble, 1967. *Nebr. Univ. State Mus., Bul.* 6: 27-42, 5 figs., 1 table, 1 map (redescription, synonymy).

**Biology:** Michener and Rettenmeyer, 1956. *Kans. Univ. Sci. Bul.* 37: 679-681, fig. 21 (nest architecture, life history, parasites, as *bipunctata*). —Ribble, 1967. *Nebr. Univ. State Mus., Bul.* 6: 37, table 1 (floral relationships).

### Genus ANDRENA Subgenus LEUCANDRENA Hedicke

*Andrena* subg. *Leucandrena* Hedicke, 1933. *Berlin Zool. Mus., Mitt.* 19: 215.

Type-species: *Apis sericea* Christ. Orig. desig.

**Taxonomy:** Lanham, 1949. *Calif. Univ. Pubs. Ent.* 8: 220 (tax. characters). —LaBerge, 1964. *Nebr. Univ. State Mus., Bul.* 4: 285, 290, 310 (tax. characters).

**bifurcata** Mitchell. Mich., Ohio.

*Andrena (Leucandrena) bifurcata* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 211, figs. 40-42. ♂.

**chippewaensis** Mitchell. Mich., N. B.

*Andrena (†Leucandrena) chippewaensis* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 212, fig. 43. ♀.

**Taxonomy:** Knerer and Atwood, 1963. *Canad. Ent.* 95: 584, figs. 2, 4. ♂.

**electrica** Casad and Cockerell. N. Mex.

*Andrena electrica* Casad and Cockerell, 1896. *Ann. and Mag. Nat. Hist.* (6) 18: 89. ♂, ♀.

**Taxonomy:** Cockerell, 1898. *Denison Univ. Sci. Labs., Bul.* 11: 49. ♀, ♂ (key).

**erythronii** Robertson. Que. to Mich., Ill. and Kans., south to Maine and Mass. Pollen: Primarily collects pollen of *Erythronium* including *E. mesochoreum*, but also collects pollen from the flowers of *Malus*, *Prunus*, *Quercus*, *Taraxacum*; visits other flowers presumably for nectar including *Amelanchier*, *Claytonia*, *Erigenia*, *Hepatica*, *Salix*.

*Andrena erythronii* Robertson, 1891. *Amer. Ent. Soc., Trans.* 18: 53. ♀, ♂.

**Taxonomy:** Robertson, 1902. *Amer. Ent. Soc., Trans.* 28: 190, 193. ♀, ♂ (key). —Michener, 1953. *Kans. Univ. Sci. Bul.* 35: 1035, figs. 88-91 (larva). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 212-213, figs. 40-42 (redescription). —Yager and Rozen, 1966. *Amer. Mus. Novitates* 2265: 5 (pupa).

**Biology:** Michener and Rettenmeyer, 1956. *Kans. Univ. Sci. Bul.* 37: 645-679, figs. 1-20 (nest architecture, life history, floral relationships, mating, number of females per nest, immature stages).

**lupini** Cockerell. Calif. Pollen: Unknown, but visits flowers of *Arctostaphylos glandulosa*, *A. glauca*, *Ceanothus cuneatus*, *C. greggii*, *C. integerrimus*, *C. verrucosus*, *Clematis lasiantha*, *Erodium botrys*, *Eschscholzia californica*, *Lasthenia chrysostoma*, *Lathyrus alfeldii*, *Lupinus*, *Phacelia*.

*Andrena lupini* Cockerell, 1936. *Pan-Pacific Ent.* 12: 142. ♀.

**mariposorum** Viereck. Calif.

*Andrena (Andrena) mariposorum* Viereck, 1917. *Amer. Ent. Soc., Trans.* 43: 382. ♀.

**parnassiae** Cockerell. Mich., Wis., Vt. Pollen: Unknown, but visits flowers of *Parnassia*.

*Andrena parnassiae* Cockerell, 1902. *Ann. and Mag. Nat. Hist.* (7) 9: 105. ♀.

**Taxonomy:** Graenicher, 1904. *Ent. News* 15: 66. ♀, ♂. —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 213-214, figs. 40-43 (redescription).

**perezana** Viereck and Cockerell. Nebr.

*Andrena perezana* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 47. ♀.

**pieta** Mitchell. N. Y. (Ithaca).

*Andrena (Leucandrena) pieta* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 214. ♀.

**placida** *placida* Smith. Alaska to N. S., south to Va., Ohio, Ill., Mich., Minn. and Calif. Parasite: *Meloe opacus* LeC., *M. strigulosus* Mann., *Stylops* sp.?. Pollen: Polylectic, analyzed pollen stores reveal that a given female, with one exception, provisions her cells with only one kind of pollen which in California consisted of predominantly pollen of *Eschscholzia californica*, while others stored pollen of a ligulate Compositae (*Agoseris*?), legume (*Lupinus*?), and a crucifer (*Raphanus*?); visitation records for other flowers include *Acer*, *Amelanchier*, *Fragaria*, *Layia carnosa*, *Prunus*, *Pyrus malus*, *Taraxacum*, *Viburnum*.

*Andrena placida* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 112. ♀.

*Andrena macilenta* Provancher, 1888. Addit. Corr. Faune Ent. Canada, Hym., p. 313. ♀, ♂.

*Andrena macgillivrayi* Cockerell, 1897. Entomologist 30: 308. ♀.

*Andrena saliceacea* Robertson, 1900. Acad. Sci. St. Louis, Trans. 10: 48. ♀.

Taxonomy: Morice and Cockerell, 1901. Canad. Ent. 33: 151 (type of *placida*). —Cockerell, 1906. Psyche 13: 7 (type of *placida*). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 214-216, figs. 40-42, table 6 (redescription). —Thorp and Stage, 1968. Ent. Soc. Amer., Ann. 61: 1583-1584, figs. 3-9. (immature stages, chromosome number).

Biology: Clements and Long, 1923. Carnegie Inst. Wash., Pub. 336: 249 (ecology). —Thorp and Stage, 1968. Ent. Soc. Amer., Ann. 61: 1580-1586, 9 figs., table (nest architecture, life history, floral relationships, parasites).

**placida** *sapellonis* Cockerell. Colo., N. Mex.

*Andrena sapellonis* Cockerell, 1900. Ann. and Mag. Nat. Hist. (7) 5: 19. ♀.

**recta** Mitchell. Minn. to N. Y. south to N. C. Pollen: Unknown, but visits flowers of *Helianthus annuus*. Predator: *Philanthus* sp.

*Andrena (Leucandrena) recta* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 217, fig. 43. ♀.

**seavillensis** Mitchell. N. J. (South Seaville).

*Andrena (?Leucandrena) seavillensis* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 217, fig. 43. ♀.

**trapezoidina** Viereck and Cockerell. Nebr.

*Andrena trapezoidina* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 58. ♀.

### Genus ANDRENA Subgenus MELANDRENA Perez

*Melandrena* Perez, 1890. Soc. Linn. Bordeaux, Actes 44: 170.

Type-species: *Andrena morio* Brulle. Desig. by Hedicke, 1933.

*Andrena* subg. *Gymnandrena* Hedicke, 1933. Berlin Zool. Mus., Mitt. 19: 213.

Type-species: *Apis thoracica* Fabricius. Orig. desig.

*Andrena* subg. *Cryptandrena* Lanham, 1949. Calif. Univ. Pubs. Ent. 8: 222. Preocc.

Type-species: *Andrena carlini* Cockerell. Orig. desig.

*Andrena* subg. *Bythandrena* Lanham, 1950. Ent. News 61: 140. N. name.

Taxonomy: LaBerge, 1964. Nebr. Univ. State Mus., Bul. 4: 310, 311 (tax. characters, as *Gymnandrena* and *Melandrena*). —LaBerge, 1971. Pan-Pacific Ent. 47: 47 (synonymy).

**bisignata** Mitchell. Mass. to N. C., west to Minn. Pollen: Unknown, but visits flowers of *Erythronium americanum*, *Ilex verticillata*, *Prunus serotina*, *Pyrus malus*, *Salix sericea*, *Viburnum acerifolium*.

*Andrena (Gymnandrena) bisignata* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 122, figs. 20, 22, 23. ♀, ♂.

**bryanti** Cockerell. Alta.

*Andrena bryanti* Cockerell, 1938. Canad. Ent. 70: 5. ♀.

**carlini** *carlini* Cockerell. N. S. to Ga., west to Minn., Colo., Wyo. and Oreg.?, B. C.? Pollen:

Apparently polylectic, visits flowers of *Amelanchier*, *Anemonella*, *Arabis*, *Brassica*, *Cercis*, *Chaerophyllum*, *Claytonia*, *Cornus*, *Dentaria*, *Dicentra*, *Erigenia*, *Erythronium*, *Hepatica*, *Heracleum*, *Hydrophyllum*, *Isopyrum*, *Malus*, *Polemonium*, *Prunus*, *Pyrus*,

*Rhus, Ribes, Rubus, Salix, Sanguinaria, Sassafraz, Smilacina, Solidago, Thaspium, Trugana, Trifolium, Uvularia, Vaccinium, Viburnum, Vicia.*

*Andrena carlini* Cockerell, 1901. *Canad. Ent.* 23: 150, 153. ♀.

Taxonomy: Atwood, 1934. *Canad. Jour. Res.* 10: 207, 209. ♀, ♂ (key). — Lanham, 1941. *Ent. Soc. Amer., Ann.* 34: 705, 708. ♀, ♂ (key). — Mitchell, 1960. *N. C. Agr. Expt. Sta. Tech. Bul.* 141: 111-112, figs. 17, 19, table 3 (redescription).

Biology: Atwood, 1933. *Canad. Jour. Res.* 9: 456 (floral relationships). — Brittain, 1933. *Canad. Dept. Agr., Bul.* 162: 94, figs. (floral relationships).

**carlini neorhodura** Mitchell. Mass., Pa., Mich.

*Andrena (Bythandrena) carlini neorhodura* Mitchell, 1960. *N. C. Agr. Expt. Sta. Tech. Bul.* 141: 113. ♂.

**carliniformis** Viereck and Cockerell. B. C. to Calif., east to Wyo., Colo. and Utah. Pollen:

Unknown, but visits flowers of *Agastache urticifolia*, *Allium*, *Calochortus*, *Ceanothus*, *Chamaebatia foliolosa*, *Eriogonum*, *Euphorbia crenulata*, *Gilia*, *Horkelia*, *Lappula*, *Lotus nevadensis*, *Lupinus bicolor*, *Phacelia Plagiobothrys nothofulvus*, *Potentilla*, *Prunus demissa*, *Ranunculus californicus*, *Rhamnus crocea*, *R. californica*, *Salix*, *Salvia columbariae*, *Taraxacum officinale*, *Vicia*, *Wyethia*.

*Andrena carliniformis* Viereck and Cockerell, 1914. *U. S. Natl. Mus., Proc.* 48: 25. ♀.

**carolinensis** Mitchell. N. C. (Raleigh). Pollen: Unknown, but visits flowers of *Vicia caroliniana*.

*Andrena (Gymnandrena) carolinensis* Mitchell, 1960. *N. C. Agr. Expt. Sta. Tech. Bul.* 141: 123, fig. 20. ♀.

**cerasifolii** Cockerell. Calif., Ariz., Utah, N. Mex. Pollen: Polylectic, visits flowers of

*Arctostaphylos drupacea*, *A. glauca*, *A. mariposa*, *A. patula*, *Brassica arvensis*, *B. campestris*, *Ceanothus cuneatus*, *C. greggii*, *C. palmeri*, *Cirsium californicum*, *Clarkia biloba*, *C. nitens*, *C. unguiculata*, *Cryptantha intermedia*, *Emmenanthe penduliflora*, *Eriogonum fasciculatum*, *Erodium*, *Erysimum asperum*, *Heteromeles arbutifolia*, *Horkelia bolanderi*, *Hypoxis emoryi*, *Penstemon spectabilis*, *Phacelia brachyloba*, *P. cicutaria*, *Rhamnus californicus*, *R. crocea*, *Rhus trilobata*, *Ribes indecorum*, *Salix hindsiana*, *S. lasiolepis*, *Sisymbrium irio*, *Swertia parryi*, *Trichostema parryi*, *Viburnum*.

*Andrena cerasifolii* Cockerell, 1896. *Ent. Monthly Mag.* (2) 7: 220. ♂.

*Andrena mimetica* Cockerell, 1903. *Ann. and Mag. Nat. Hist.* (7) 12: 412. ♀, ♂.

*Andrena mimetica* var. *falli* Cockerell, 1907. *Ann. and Mag. Nat. Hist.* (7) 19: 536.

Taxonomy: Cockerell, 1898. *Denison Univ. Sci. Labs., Bul.* 11: 48. ♂ (key). — Cockerell, 1924. *Pan-Pacific Ent.* 1: 58. ♂. — Timberlake, 1951. *In* Muesebeck, Krombein and Townes, *U. S. Dept. Agr., Agr. Monog.* 2: 1060 (synonymy).

Biology: Linsley, 1937. *Brooklyn Ent. Soc., Bul.* 32: 125 (floral relationships, number of generations). — MacSwain, Raven, Thorp, 1973. *Calif. Univ. Pubs. Ent.* 70: 46 (floral relationships).

**commoda** Smith. Southeast. Canad., south to Ga., west to N. Dak. Pollen: Unknown, but visits flowers of *Cornus paniculata*.

*Andrena commoda* Smith, 1879. *Descr. New Species Hym. Brit. Mus.*, p. 53. ♀.

*Andrena corni* Robertson, 1900. *Acad. Sci. St. Louis, Trans.* 10: 50. ♀.

*Andrena pyrura* Cockerell, 1906. *Ann. Mag. and Nat. Hist.* (7) 17: 309. ♀.

Taxonomy: Morice and Cockerell, 1901. *Canad. Ent.* 33: 152 (type). — Cockerell, 1906. *Psyche* 13: 6. ♀ (type). — Viereck, 1907. *Ent. News* 18: 283, 286. ♀, ♂ (key). — Cockerell, 1931. *Amer. Mus. Novitates* 458: 18, 19. — Mitchell, 1960. *N. C. Agr. Expt. Sta. Tech. Bul.* 141: 124, figs. 22-23, table 3 (redescription, synonymy).

**confederata** Viereck. Ohio to N. J., south to Fla. Pollen: Unknown, but visits flowers of *Amelanchier*, *Castanea*, *Crataegus*, *Fragaria*, *Ilex*, *Malus*, *Padus*, *Prunus*, *Pyracantha*, *Rubus*.

*Andrena (Andrena) confederata* Viereck, 1917. *Amer. Ent. Soc., Trans.* 43: 375. ♀, ♂.

Taxonomy: Mitchell, 1960. *N. C. Agr. Expt. Sta. Tech. Bul.* 141: 125, figs. 22-23, table 3 (redescription).

**critica** Mitchell. N. Y. (Catskill Mts.).

*Andrena (Bythandrena) critica* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 113. ♀.

**dunningi** Cockerell. Que. to N. C., west to Minn. Pollen: Unknown, but visits flowers of

*Claytonia*, *Gleditsia*, *Malus*, *Narcissus*, *Ribes*, *Rubus*, *Salix*, *Taraxacum*, *Viburnum*.

*Andrena dunningi* Cockerell, 1898. Canad. Ent. 30: 103. ♀.

*Andrena viciniiformis* Robertson, 1900. Acad. Sci. St. Louis, Trans. 10: 47. ♀, ♂.

*Andrena annae* Cockerell, 1931. Canad. Ent. 63: 200. ♀.

Taxonomy: Robertson, 1902. Amer. Ent. Soc., Trans. 28: 190, 192. ♀, ♂ (key). —Timberlake, 1951. In Linsley, In Muesebeck, Krombein and Townes, U. S. Dept. Agr., Agr. Monog. 2: 1064 (synonymy). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 113-114, figs. 18-19, table 3 (redescription).

**errans** Smith. B. C. to Calif. and N. Mex. Pollen: Unknown, but visits flowers of

*Arctostaphylos mariposa*, *Ceanothus*, *Eriogonum marifolium*, *Lappula*, *Ranunculus*, *Salix*.

*Andrena errans* Smith, 1879. Descr. New Species Hym. Brit. Mus., p. 55. ♀, ♂.

*Andrena pluvialis* Cockerell, 1901. Canad. Ent. 33: 154. ♀.

*Andrena junonia* Viereck, 1904. Canad. Ent. 36: 191. ♀.

*Andrena compactiscopa* Viereck, 1904. Canad. Ent. 36: 191. ♀.

*Andrena argentiniae* var. *trichomelaena* Cockerell, 1913. Ann. and Mag. Nat. Hist. (8) 12: 376. ♂, ♀.

*Andrena spaldingi* Cockerell, 1934. Amer. Mus. Novitates 697: 3. ♀.

Taxonomy: Morice and Cockerell, 1901. Canad. Ent. 33: 153 (type). —Cockerell, 1903. Ann.

and Mag. Nat. Hist. (7) 12: 443. ♂ (as *pluvialis*). —Cockerell, 1906. Psyche 13: 34 (type).

—Timberlake, 1951. In Linsley, In Muesebeck, Krombein and Townes, U. S. Dept. Agr., Agr. Monog. 2: 1065 (synonymy).

**flexa** Malloch. Ill. to Tex. Parasite: *Nomada* sp.

*Andrena flexa* Malloch, 1917. Brooklyn Ent. Soc., Bul. 12: 92. ♀.

Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 126 (redescription).

Biology: Rozen, 1966. Amer. Mus. Novitates 2244: 26 (parasite).

**gabrielsoni** Mitchell. Maine, Conn., N. C., Mich.

*Andrena (Bythandrena) gabrielsoni* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 115. ♀.

**hilaris** Smith. Mich. and Ohio to eastern Canada and New England States, south to Ga. and Ala. Pollen: Unknown, but visits flowers of *Aronia*, *Crataegus*, *Hydrangea*, *Ilex*, *Malus*, *Prunus*, *Pyrus*, *Rubus*, *Salix*, *Vaccinium*.

*Andrena hilaris* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 112. ♀.

Taxonomy: Morice and Cockerell, 1901. Canad. Ent. 33: 151 (type). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 126-127, figs. 21-23, table 3 (redescription).

**lupinorum helenae** Cockerell. Colo.

*Andrena lupinorum helenae* Cockerell, 1934. Amer. Mus. Novitates 697: 2. ♀.

**lupinorum lupinorum** Cockerell. Wyo., Colo., Nebr. Pollen: Unknown, but visits flowers of *Lupinus*.

*Andrena lupinorum* Cockerell, 1906. Ann. and Mag. Nat. Hist. (7) 17: 308. ♀.

*Andrena vicina argentiniae* Cockerell, 1906. Amer. Mus. Nat. Hist., Bul. 22: 432. ♀.

Taxonomy: Lanham, 1941. Ent. Soc. Amer., Ann. 34: 705. ♀ (key). —Timberlake, 1951. In Linsley, In Muesebeck, Krombein and Townes, U. S. Dept. Agr., Agr. Monog. 2: 1070 (synonymy).

**macra** Mitchell. N. C. Pollen: Unknown, but visits flowers of *Crataegus*, *Pyracantha*, *Rubus*.

*Andrena macra* Mitchell, 1951. Elisha Mitchell Sci. Soc., Jour. 67: 246, figs. 1-3. ♀, ♂.

Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 127-128, figs. 22-23, table 3 (redescription).

Biology: Sivik, 1954. Ent. News 65: 253-255 (nest, supersedure).



- nigra** Provancher. Ariz., south. Calif.; Mexico (Baja California). Pollen: Apparently an oligolege of *Phacelia* including *P. distans*, but also visits flowers of *Coreopsis maritima*, *Cryptantha intermedia*, *Layia platyglossa*, *Malacothrix*, *Malus*, *Salix*.  
*Andrena nigra* Provancher, 1896. Nat. Canad. 23: 173. ♀.  
*Andrena griseonigra* Cockerell, 1905. Canad. Ent. 37: 371. ♂.  
*Andrena subtristis* Cockerell, 1905. Canad. Ent. 37: 372. ♀.

Taxonomy: Linsley, 1938. Calif. Acad. Sci., Proc. (4) 23: 266, 279. ♀, ♂ (key).

Biology: Linsley, 1938. Calif. Acad. Sci., Proc. (4) 280 (floral relationships).

**nigripes** Provancher. Calif.

*Andrena nigripes* Provancher, 1895. Nat. Canad. 22: 173. ♀.

**nivalis** Smith. Que. to Ga., west to B. C., south to Calif. and N. Mex. Pollen: Unknown, but visits flowers of *Hydrangea*, *Rhododendron*, *Rubus*, *Vagnera*.

*Andrena nivalis* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 118. ♀, ♂.

*Andrena convexa* Provancher, 1888. Addit. Corr. Faune Ent. Canada, Hym., p. 311. ♀, ♂.

*Andrena semirufa* Cockerell, 1900. Ann. and Mag. Nat. Hist. (7) 5: 407. ♀.

*Andrena solidula* Viereck, 1904. Canad. Ent. 36: 191, 194. ♀, ♂.

*Andrena idahorum* Viereck, 1916. Amer. Mus. Nat. Hist., Bul. 35: 732. ♀.

Taxonomy: Morice and Cockerell, 1901. Canad. Ent. 33: 151. ♀ (type). —Cockerell, 1906.

Psyche 13: 9 (type). —Cockerell, 1931. Amer. Mus. Novitates 458: 14. ♀ (key, as *semirufa*).

—Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 128-129, figs. 22, 23, table 3 (redescription, synonymy).

**obscuripennis** Smith. N. J.(?), N. C., Ga., La.(?). Parasite: *Nomada crudelis* Cress.? Pollen: Unknown, but visits flowers of *Batodendron*, *Crataegus*, *Ilex*, *Padus*.

*Andrena obscuripennis* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 188. ♀.

Taxonomy: Morice and Cockerell, 1901. Canad. Ent. 33: 150. ♀ (type). —Cockerell, 1906.

Psyche 13: 36. ♀ (type). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 129-131, figs. 21, 23, table 3 (redescription).

**perimelas** Cockerell. Coastal Calif. and Catalina Island Parasite: *Nomada edwardsii edwardsii* Cress., *Stylops pacifica* Bohart, *S. vandykei* Bohart. Pollen: Apparently polylectic, visits flowers of *Brassica*, *Coreopsis maritima*, *Crepis*, *Limnanthes douglasii*, *Mesembryanthemum edule*, *Prunus*, *Ranunculus californicus*, *Raphanus sativus*, *Ribes cereum*, *Rubus*, *Salix*, *Sisymbrium bellum*, *Zygadenus fremontii*.

*Andrena perimelas* Cockerell, 1905. Canad. Ent. 37: 371. ♀.

*Andrena meadowsi* Cockerell, 1938. Ann. and Mag. Nat. Hist. (11) 2: 146. ♂.

Biology: Linsley and MacSwain, 1955. Wasmann Jour. Biol. 13: 254-256, 270, pl. 1, fig. 5 (nest, floral relationships, parasite). —Linsley and MacSwain, 1959. Calif. Univ. Pubs. Ent. 16: 19, pl. 5 (nest, floral relationships, parasite, stylopization).

**pertristis** Cockerell. Calif. Pollen: Unknown, but visits flowers of *Brassica*, *Cryptantha intermedia*, *Eriodictyon trichocalyx*, *Fremontodendron californica*, *Lupinus formosus*, *Malus*, *Nemophila integrifolia*, *Phacelia heterophylla*, *Stanleya pinnata*.

*Andrena pertristis* Cockerell, 1905. Canad. Ent. 37: 372. ♀.

Taxonomy: Linsley, 1938. Calif. Acad. Sci., Proc. (4) 23: 265, 267. ♀, ♂ (key).

**platyrhina** Cockerell. Colo.

*Andrena (Pterandrena) platyrhina* Cockerell, 1930. N. Y. Ent. Soc., Jour. 37: 446. ♀.

**pruni** Robertson. Minn. and Ill. to Mass., south to Ga. Pollen: Unknown, but visits flowers of *Aruncus*, *Claytonia*, *Crataegus*, *Dentaria*, *Heracleum*, *Pastinaca*, *Polemonium*, *Prunus*, *Ribes*, *Rubus*, *Salix*, *Staphylea*, *Uvularia*, *Viburnum*, *Zanthoxylum*.

*Andrena pruni* Robertson, 1891. Amer. Ent. Soc., Trans. 18: 51. ♀, ♂.

Taxonomy: Robertson, 1902. Amer. Ent. Soc., Trans. 28: 191, 192. ♀, ♂ (key). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 117-118, figs. 19-20, table 3 (redescription).

**pulverulenta** Viereck. Oreg.

*Andrena pulverulenta* Viereck, 1904. Canad. Ent. 36: 190, 195. ♀, ♂.

**regularis** Malloch. B. C. to N. S., in eastern U. S. from Minn. to New England States, south to Ga. Pollen: Unknown, but visits flowers of *Aster*, *Brassica*, *Pyrus*, *Rubus*, *Syringa*, *Vaccinium*.

*Andrena regularis* Malloch, 1917. Brooklyn Ent. Soc., Bul. 12: 91. ♂, ♀.

Taxonomy: Atwood, 1934. Canad. Jour. Res. 10: 207, 209. ♀, ♂ (key). — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 118-119, figs. 18-19, table 3 (redescription).

**sayi** Robertson. N. B. to N. C., west to Minn., Ill. and Kansas. Pollen: Unknown, but visits flowers of *Amelanchier*, *Aronia*, *Brassica*, *Cercis*, *Crataegus*, *Malus*, *Padus*, *Prunus*, *Pyrus*, *Rubus*, *Salix*, *Stellaria*, *Taraxacum*, *Vaccinium*.

*Andrena sayi* Robertson, 1891. Amer. Ent. Soc., Trans. 18: 52. ♀, ♂.

Taxonomy: Robertson, 1902. Amer. Ent. Soc., Trans. 28: 191, 192. ♀, ♂ (key). — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 131-132, fig. 23, table 3 (redescription).

**sevierensis** Mitchell. Tenn. (Sevier Co.).

*Andrena* (?*Gymnandrena*) *seviensis*(!) Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 132, fig. 20. ♀.

*Andrena* (?*Gymnandrena*) *sevierensis* Krombein, 1967. In Krombein and Burks, U. S. Dept. Agr., Agr. Monog. 2, Second Suppl. p. 434. Emend.

**sola** Viereck. B. C. to Calif., Ariz.; Mexico (Baja California). Pollen: Unknown, but visits flowers of *Amsinckia intermedia*, *Arctostaphylos*, *Baccharis*, *Brassica*, *Ceanothus crassifolius*, *Chaenactis glabriuscula*, *Clematis lasiantha*, *Cryptantha intermedia*, *Encelia farinosa*, *Eriodictyon*, *Gallium nuttallii*, *Gilia*, *Layia platyglossa*, *Melilotus*, *Papaver californica*, *Plagiobothrys californicus*, *Platystemon californica*, *Prunus subcordatus*, *Quercus*, *Ranunculus*, *Rhamnus californica*, *R. crocea*, *Rhus diversiloba*, *R. trilobata*, *Senecio californicus*, *Solanum umbelliferum*, *Tamarix*.

*Andrena* (*Andrena*) *sola* Viereck, 1916. Acad. Nat. Sci. Phila., Proc. 68: 577. ♀.

*Andrena carissima* Cockerell, 1924. Pan-Pacific Ent. 1: 58. ♀.

*Andrena microdonta* Cockerell, 1924. Pan-Pacific Ent. 1: 61. ♂.

*Andrena ensenadensis* Cockerell, 1941. San Diego Soc. Nat. Hist., Trans. 9: 345. ♀.

Taxonomy: Timberlake, 1951. In Linsley, In Muesebeck, Krombein and Townes, U. S. Dept. Agr., Agr. Monog. 2: 1081 (synonymy).

**transnigra** Viereck. B. C. to Calif., Colo. and Wyo. Pollen: Unknown, but visits flowers of *Allium*, *Brassica*, *Ceanothus integerrimus*, *C. parviflorus*, *Chamaebatia foliolosa*, *Lappula*, *Madia ramii*, *Ranunculus*, *Ribes*, *Salix*, *Taraxacum*, *Vaccinium*, *Wyethia*.

*Andrena transnigra* Viereck, 1904. Canad. Ent. 36: 191. ♀.

*Andrena cyanura* Cockerell, 1916. Canad. Ent. 48: 252. ♀.

*Andrena transnigra paysoni* Cockerell, 1924. Ent. News 35: 349. ♀.

Taxonomy: Cockerell, 1931. Amer. Mus. Novitates 458: 18. ♀.

**vicina** Smith. N. S. to Ga., west to B. C., Colo. and Oreg. Parasite: *Nomada imbricata* Sm., *N. oblitterata* Cress., *N. vicina vicina* Sm. Pollen: Unknown, but visits flowers of *Amelanchier*, *Azalea*, *Caragana*, *Castanea*, *Ilex*, *Malus*, *Narcissus*, *Padus*, *Prunus*, *Pyrus*, *Rhododendron*, *Rhodura*, *Rubus*, *Salix*, *Scilla*, *Spiraea*, *Taraxacum*, *Trifolium*, *Tulipa*, *Vaccinium*, *Viburnum*.

*Andrena vicina* Smith, 1853. Cat. Hym. Brit. Mus., v. 1 p. 112. ♀.

Taxonomy: Morice and Cockerell, 1901. Canad. Ent. 33: 151 (type). — Cockerell, 1906. Psyche 13: 9. — Atwood, 1934. Canad. Jour. Res. 10: 207, 210, figs. ♀, ♂ (key). — Lanham, 1941. Ent. Soc. Amer., Ann. 34: 705, 708. ♀, ♂ (key). — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 132-134, fig. 23, table 3 (redescription).

Biology: Packard, 1869. Guide Study Ins., p. 144 (nesting habits, parasites). — Clements and Long, 1923. Carnegie Inst. Wash., Pub. 336: 249 (ecology). — Salt, 1927. Jour. Expt. Zool. 48: 251 (stylopization).

**victima** Smith. N. S. to Ont. and Conn. Possibly a syn. of *A. vicina* Smith.

*Andrena victima* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 113. ♀.

*Andrena desponsa* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 114. ♂.

Taxonomy: Morice and Cockerell, 1901. *Canad. Ent.* 33: 123, 124. ♀, ♂ (types). —Cockerell, 1906. *Psyche* 13: 36. ♀ (type). —Mitchell, 1960. *N. C. Agr. Expt. Sta. Tech. Bul.* 141: 134-135 (stylopization and its possible effect on tax. characters).

**Genus ANDRENA Subgenus MICRANDRENA Ashmead**

*Micrandrena* Ashmead, 1899. *Amer. Ent. Soc., Trans.* 26: 89.

Type-species: *Andrena melanochoera* Cockerell. Monotypic and orig. desig.  
(= *Micrandrena pacifica* Ashmead).

*Andrena* subg. *Andrenella* Hedicke, 1933. *Berlin Zool. Mus., Mitt.* 19: 210.

Type-species: *Melitta minutula* Kirby. Orig. desig.

Revision: Ribble, 1968. *Nebr. Univ. State Mus., Bul.* 8: 242-333, figs. 1-89, maps 1-10, tables 1-11 (*N. Amer. spp.*).

Taxonomy: Lanham, 1949. *Calif. Univ. Pubs. Ent.* 8: 208 (tax. characters). —LaBerge, 1964. *Nebr. Univ. State Mus., Bul.* 4: 301 (tax. characters).

**annectens** Ribble. *Calif. (San Benito Co.) Pollen*: Unknown, but visits flowers of *Salix*.

*Andrena (Micrandrena) annectens* Ribble, 1968. *Nebr. Univ. State Mus., Bul.* 8: 323, figs. 80-84. ♀, ♂.

**candidiformis** Viereck and Cockerell. B. C. and Wash. to Calif., east to Wyo., Colo. and Ariz.

Pollen: Polylectic, visits a wide variety of flowers including *Arctostaphylos patula*, *A. pungens*, *Arenaria douglasii*, *Baccharis*, *Ceanothus cordulatus*, *C. cuneatus*, *C. divaricatus*, *C. greggii*, *C. integerrimus*, *Chamaebatia foliolosa*, *Crepis*, *Cryptantha*, *Eriodictyon californicum*, *Eriogonum*, *Heracleum lanatum*, *Linum lewisii*, *Lomatium dissectum*, *L. triternatum*, *Malus*, *Montia perfoliata*, *Nemophila menziesii*, *Physocarpa intermedia*, *Prunus subcordata*, *P. virginiana*, *Pyrus*, *Ranunculus californicus*, *Rhamnus californicus*, *Ribes nevadense*, *Salix foliosus*, *S. laevigata*, *S. lasiolepis*, *Solanum umbelliferum*, *Taraxacum*, *Thysanocarpus curvipes*, *Trifolium*, *Veronica americana*, *Wyethia*.

*Andrena candidiformis* Viereck and Cockerell, 1914. *U. S. Natl. Mus., Proc.* 48: 33. ♂.

*Andrena nigratarsis* Viereck and Cockerell, 1914. *U. S. Natl. Mus., Proc.* 48: 53. ♀.

*Andrena semotula* Cockerell, 1936. *Pan-Pacific Ent.* 12: 149. ♂.

Taxonomy: Cockerell, 1936. *Pan-Pacific Ent.* 12: 150. ♂. —Lanham, 1941. *Ent. Soc. Amer., Ann.* 34: 706, 708. ♀, ♂ (key). —Timberlake, 1951. *In* Linsley, *In* Muesebeck, Krombein and Townes, *U. S. Dept. Agr., Agr. Monog.* 2: 1060 (synonymy). —Ribble, 1968. *Nebr. Univ. State Mus., Bul.* 8: 288-293, figs. 49-53, map 4 (redescription, synonymy).

Biology: Ribble, 1968. *Nebr. Univ. State Mus., Bul.* 8: 291-292, table 6 (floral relationships, stylopization).

**chlorogaster** Viereck. B. C. to Calif., east to Idaho, Utah and Ariz. Parasite: *Stylops duboisi*

Bohart, *Imparipes* sp. Pollen: Polylectic, visits a wide variety of flowers including *Alyssum maritimum*, *Amsinckia*, *Arctostaphylos crustacea*, *A. glauca*, *A. mariposa*, *A. pungens*, *Baccharis*, *Brassica*, *Capsella bursa-pastoris*, *Ceanothus crassifolius*, *C. cuneatus*, *C. greggii*, *C. oreuttii*, *C. soredatus*, *Cercocarpus betuloides*, *Collinsia heterophylla*, *Cryptantha*, *Daucus*, *Descourainia sophia*, *Eriodictyon californicum*, *Geranium molle*, *Gilia*, *Lasthenia chrysostoma*, *Layia glandulosa*, *Lomatium dasycarpum*, *L. dissectum*, *L. triternatum*, *L. utriculatum*, *Montia perfoliata*, *Nemophila menziesii*, *Phacelia ciliata*, *P. distans*, *Prunus subcordata*, *Ranunculus californicus*, *R. canus*, *Rhamnus crocea*, *Rhus diversiloba*, *Salix gooddingii*, *S. lasiolepis*, *S. leucodendroides*, *S. nigra*, *Sambucus*, *Sanicula bipinnatifida*, *S. crassicaulis*, *S. nevadensis*, *S. tuberosa*, *Sedum*, *Sisymbrium irio*, *Sonchus*, *Tamarix*, *Taraxacum officinale*, *Trifolium pratense*.

*Andrena chlorogaster* Viereck, 1904. *Canad. Ent.* 35: 189. ♀.

*Andrena subtilicornis* Viereck, 1926. *Pomona Jour. Ent. Zool.* 18: 4. ♂.

*Andrena (Micrandrena) nitidicornis* Cockerell, 1936. *Pan-Pacific Ent.* 12: 144. ♂.

*Andrena catalinica* Cockerell, 1939. *Pomona Jour. Ent. Zool.* 31: 25. ♀.

*Andrena (Micrandrena) chlorogaster nesiotis* Timberlake, 1951. *U. S. Natl. Mus., Proc.* 101: 394. ♂.

*Andrena (Micrandrena) chlorogaster gavilanica* Timberlake, 1951. U. S. Natl. Mus., Proc. 101: 394. ♂, ♀.

*Andrena (Micrandrena) radialis* Timberlake, 1951. U. S. Natl. Mus., Proc. 101: 395. ♂, ♀.

Taxonomy: Timberlake, 1951. U. S. Natl. Mus. Proc. 101: 396 (tax. characters, as *nitidicornis*). — Ribble, 1965. Kans. Ent. Soc., Jour. 38: 87, fig. 1 (anomalous specimen). — Ribble, 1968. Nebr. Univ. State Mus., Bul. 8: 279-288, figs. 41-48, map 2 (redescription, synonymy).

Biology: Ribble, 1968. Nebr. Univ. State Mus., Bul. 8: 287-288, table 5 (floral relationships, parasites).

*illinoensis* Robertson. South. Canada (Man. to Alta.) and Ohio, Mich., west to Wash., Oreg. and south. Calif. (Blythe), south to Tex., N. Mex. and Ariz. Parasite: *Stylops bruneri* Pierce. Pollen: Polylectic, visits a wide variety of flowers including *Amelanchier*, *Amorpha fruticosa*, *Anemone*, *Antennaria plantaginifolia*, *Capsella*, *Cardamine*, *Ceanothus ovatus*, *Cornus*, *Crataegus*, *Descourainia pinnata*, *Lepidium*, *Lomatium daucifolium*, *L. foeniculaceum*, *Nasturtium*, *Prunus americana*, *Pyrus*, *Rhus aromatica*, *Ribes missouriense*, *Rosa*, *Rubus*, *Salix amygdaloides*, *S. babylonica*, *S. cordata*, *S. interior*, *S. nigra*, *Senecio*, *Shepherdia argentea*, *Sisymbrium*, *Sphaeralcea coccinea*, *Spiraea thunbergii*, *Taraxacum officinale*, *T. vulgare*, *Thlaspi arvense*, *Zizia aurea*.

*Andrena illinoensis* Robertson, 1891. Amer. Ent. Soc., Trans. 18: 54. ♀, ♂.

*Andrena salicinella* Cockerell, 1895. Psyche 7 (sup.): 4. ♀.

*Andrena placitae* Cockerell, 1903. Ent. News 14: 215. ♂.

*Andrena vegana* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 17. ♀.

Taxonomy: Robertson, 1902. Amer. Ent. Soc., Trans. 28: 190, 192. ♀, ♂ (key). — Cockerell, 1914. Ann. and Mag. Nat. Hist. (8) 14: 10. ♀ (key). — Lanham, 1941. Ent. Soc. Amer., Ann. 34: 706, 708. ♀, ♂ (key). — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 162-163, figs. 29, 31-32, table 4 (redescription). — Ribble, 1968. Nebr. Univ. State Mus., Bul. 8: 299-308, figs. 59-63, map 6 (redescription, synonymy).

Biology: Ribble, 1968. Nebr. Univ. State Mus., Bul. 8: 306-307, table 8 (floral relationships, stylopization).

*ishii* Ribble. Calif. Pollen: Unknown, but visits flowers of *Salix*.

*Andrena (Micrandrena) ishii* Ribble, 1968. Nebr. Univ. State Mus., Bul. 8: 319, figs. 70-74, map 8. ♀, ♂.

*labergei* Ribble. Ariz. (Southwestern Research Station), N. Mex. (Fort Wingate). Pollen: Unknown, but visits flowers of *Salix*.

*Andrena (Micrandrena) labergei* Ribble, 1968. Nebr. Univ. State Mus., Bul. 8: 321, figs. 75-79, map 8. ♀, ♂.

*lamelliterga* Ribble. Md., Pa., Ind., Tenn., Ill., Kans. Pollen: Unknown, but visits flowers of *Phacelia* including *P. dubia*, *P. ranunculacea*.

*Andrena (Micrandrena) lamelliterga* Ribble, 1968. Nebr. Univ. State Mus., Bul. 8: 272, figs. 31-35, map 4. ♀, ♂.

*lepidii* Ribble. South. Calif.; Mexico (Baja California). Pollen: Unknown, but visits flowers of *Cryptantha*, *Lasthenia chrysostoma*, *Lepidium flavum*.

*Andrena (Micrandrena) lepidii* Ribble, 1968. Nebr. Univ. State Mus., Bul. 8: 262, figs. 16-20, map 3. ♀, ♂.

*melanochroa* Cockerell. N. S. to N. C., west to B. C., Wash., Oreg. and Calif. Pollen: Polylectic, apparently with a preference for pollens of *Fragaria* and *Potentilla*, but visits a variety of flowers including *Ceanothus*, *Cerastium arvense*, *Cornus drummondii*, *Fragaria virginiana*, *Kalmia*, *Potentilla canadensis*, *Ranunculus*, *Rubus*, *Salix*, *Taraxacum officinale*, *Vaccinium*, *Waldsteinia*.

*Andrena melanochroa* Cockerell, 1898. Entomologist 31: 89. ♀, ♂.

*Micrandrena pacifica* Ashmead, 1899. Amer. Ent. Soc., Trans. 43: 54. ♀, ♂.

*Andrena fragariana* Graenicher, 1904. Ent. News 15: 64. ♀, ♂.

*Andrena (Micrandrena) vagans* Cockerell, 1932. Canad. Ent. 64: 157. ♀.

- Taxonomy:** Cockerell, 1932. *Canad. Ent.* 64: 157. ♀ (key). —Cockerell, 1932. *Canad. Ent.* 64: 157, 158. ♀, ♂ (key, as *fragariana*). —Timberlake, 1951. In Linsley, In Muesebeck, Krombein and Townes, U. S. Dept. Agr., Agr. Monog. 2: 1071 (synonymy). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 161, figs. 29-32, table 4 (redescription). —Ribble, 1968. *Nebr. Univ. State Mus.*, Bul. 8: 293-299, figs. 54-58, map 5 (redescription, synonymy).
- Biology:** Ribble, 1968. *Nebr. Univ. State Mus.*, Bul. 8: 297, table 7 (floral relationships, stylization).
- micheneri** Ribble. *Tex.* (Brownsville). Pollen: Unknown, but visits flowers of *Lesquerella*.  
*Andrena (Micrandrena) micheneri* Ribble, 1968. *Nebr. Univ. State Mus.*, Bul. 8: 264, figs. 21-25. ♀, ♂.
- microchlora** Cockerell. B. C. to Calif., east to N. Dak., Wyo., Colo. and Ariz. Pollen: Polylectic with some preference for the pollens of the Umbelliferae and to a lesser extent those of the Cruciferae, Compositae, Caryophyllaceae and Ranunculaceae; visitation records include *Amsinckia*, *Arenaria californica*, *Brassica*, *Ceanothus cuneatus*, *Descourainia sophia*, *Euphorbia albomarginata*, *Gilia*, *Helianthus*, *Lasthenia chrysostoma*, *Lomatium dissectum*, *L. utriculatum*, *Musineon*, *Nemophila*, *Plectritis macrocera*, *Prunus virginiana*, *Ranunculus californicus*, *Salix*, *Sanicula nevadensis*, *Taraxacum*, *Tropidocarpum gracile*.  
*Andrena microchlora* Cockerell, 1922. *Ann. and Mag. Nat. Hist.* (9) 10: 265. ♂, ♀.  
*Andrena microchlora* var. *subalia* Cockerell, 1936. *Pan-Pacific Ent.* 12: 143. ♀.
- Taxonomy:** Lanham, 1941. *Ent. Soc. Amer.*, Ann. 34: 705, 707. ♀, ♂ (key). —Timberlake, 1951. U. S. Natl. Mus., Proc. 101: 397 (tax. characters and status). —Ribble, 1968. *Nebr. Univ. State Mus.*, Bul. 8: 274-279, figs. 36-40, map 3 (redescription, synonymy).
- Biology:** Ribble, 1968. *Nebr. Univ. State Mus.*, Bul. 8: 277, table 4 (floral relationships, stylization).
- neonana** Viereck. N. J. to Fla., west to Ark. and Tex. Pollen: Unknown, but visits flowers of *Fragaria virginiana*, *Ilex*, *Prunus persica*, *Pyrus*.  
*Andrena (Scrapter) neonana* Viereck, 1917. *Amer. Ent. Soc., Trans.* 43: 400. ♀.
- Taxonomy:** Ribble, 1968. *Nebr. Univ. State Mus.*, Bul. 8: 259-262, figs. 11-15, map 3 (redescription).
- nigrae** Robertson. Conn. to north. Fla., west to Alta., Wash., Idaho, Utah and Tex. Pollen: Apparently polylectic, although majority of collections have been made at the flowers of *Salix*; visitation records include *Alnus*, *Anemone virginiana*, *Antennaria plantaginifolia*, *Arabis laevigata*, *Barbarea*, *Capsella*, *Cotoneaster*, *Crataegus*, *Cymopterus acaulis*, *Descourainia pinnata*, *Erigenia bulbosa*, *Lomatium daucifolium*, *L. dissectum*, *Prunus americana*, *P. angustifolia*, *P. serotina*, *P. virginiana*, *Pyrus*, *Rhus aromatica*, *Ribes*, *Rubus*, *Salix amygdaloides*, *S. babylonica*, *S. cordata*, *S. humilis*, *S. interior*, *S. nigra*, *S. sericea*, *Sassafras albidum*, *Sphaeralcea coccinea*, *Spiraea*, *Taraxacum*, *Thlaspi arvense*, *Viburnum*, *Zizia aurea*.  
*Andrena illinoensis* var. *bicolor* Robertson, 1898. *Acad. Sci. St. Louis, Trans.* 8: 46. ♀.  
*Preoce.*  
*Andrena nigrae* Robertson, 1905. *Canad. Ent.* 37: 237. N. name.  
*Andrena salicinellina* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 17. ♂.  
*Andrena (Andrena) abacta* Viereck, 1917. *Amer. Ent. Soc., Trans.* 43: 365. ♀.
- Taxonomy:** Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 165. ♀. —Ribble, 1968. *Nebr. Univ. State Mus.*, Bul. 8: 313-319, fig. 69, map 8 (redescription, synonymy).
- Biology:** Ribble, 1968. *Nebr. Univ. State Mus.*, Bul. 8: 317, table 10 (floral relationships, stylization).
- personata** Robertson. Pa. to Ga., west to Nebr., Kans., Okla. and Tex. Pollen: Polylectic, visits a wide variety of flowers, especially those of the Rosaceae, Salicaceae, Umbelliferae, and Hydrophyllaceae in that order; visitation records include *Alliaria officinalis*, *Apocynum cannabinum*, *Arenaria patula*, *Aruncus*, *Claytonia virginica*, *Cornus*, *Crataegus crus-galli*, *C. mollis*, *Ellisia nyctelea*, *Erigeron*, *Euphorbia commutata*, *Fragaria*, *Geranium carolinianum*, *Lesquerella*, *Osmorhiza longistylus*, *Oxalis violacea*,

*Pastinaca sativa*, *Perideridea americana*, *Phacelia dubia*, *P. ranunculacea*, *P. purshii*, *Potentilla canadensis*, *Prunus*, *Ranunculus abortivus*, *R. septentrionalis*, *Rubus flagellaris*, *Salix nigra*, *Sanicula marilandica*, *Sisymbrium*, *Spiraea*, *Taenidia integerrima*, *Thaspium barbinode*, *T. trifoliatum*, *Viburnum molle*.

*Andrena personata* Robertson, 1897. Acad. Sci. St. Louis, Trans. 7: 336. ♀, ♂.

Taxonomy: Robertson, 1902. Amer. Ent. Soc., Trans. 28: 193. ♀, ♂ (key). —Cockerell, 1932. Canad. Ent. 64: 157, 158. ♀, ♂ (key). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 165-167, figs. 28, 31-33, table 4 (redescription). —Ribble, 1968. Nebr. Univ. State Mus., Bul. 8: 254-259, figs. 6-10, map 2 (redescription).

Biology: Ribble, 1968. Nebr. Univ. State Mus., Bul. 8: 257-258, table 2 (floral relationships, stylopization).

**piperi** Viereck. B. C. to Calif., east to Idaho, Colo. and Ariz. (Tucson); Mexico (Baja California).

Pollen: Polylectic, visits a wide variety of flowers, especially those of the Cruciferae; visitation records include *Agoseris aurantiaca*, *Alyssum*, *Amsinckia*, *Barbarea orthoceras*, *Brassica alba*, *B. campestris*, *B. nigra*, *Capsella bursa-pastoris*, *Cardaria draba*, *C. pubescens*, *Ceanothus*, *Cirsium*, *Cryptantha intermedia*, *C. muricata*, *Descourainia pinnata*, *D. sophia*, *Erysimum repandum*, *Lasthenia chrysostoma*, *Lepidium*, *Lobularia maritima*, *Lomatium dissectum*, *Lupinus*, *Medicago sativa*, *Penstemon*, *Phacelia fremontii*, *Platystemon californicus*, *Polygonum*, *Prunus subcordata*, *Ranunculus californicus*, *Raphanus sativus*, *Ribes*, *Rubus*, *Salix lasiolepis*, *Salsola kali*, *Sisymbrium altissimum*, *S. irio*, *S. pinnatum*, *Stellaria media*, *Tamarix*, *Taraxacum officinale*, *Thlaspi arvense*, *Tropidocarpum gracile*.

*Andrena piperi* Viereck, 1904. Canad. Ent. 35: 189. ♀.

Taxonomy: Timberlake, 1951. U. S. Natl. Mus., Proc. 101: 392. ♂. —Ribble, 1968. Nebr. Univ. State Mus., Bul. 8: 248-254, figs. 1-5, map 1 (redescription).

Biology: Ribble, 1968. Nebr. Univ. State Mus., Bul. 8: 252-254, table 1 (floral relationships, stylopization).

**salictaria** Robertson. Transcont. south. Canada (N. S. to B. C.) and Maine to N. C. west to Wash., Utah, Colo. and N. Mex. Parasite: *Stylops bruneri* Pierce. Pollen: Apparently narrowly polylectic, chiefly *Salix* including *S. bebbiana*, *S. cordata*, *S. humilis*, but visits other flowers including *Amelanchier*, *Antennaria*, *Barbarea*, *Chamaedaphne*, *Claytonia*, *Cotoneaster*, *Crataegus*, *Lomatium*, *Prunus americana*, *Rhus*, *Sassafras*, *Viburnum opulus*.

*Andrena salictaria* Robertson, 1905. Canad. Ent. 37: 236. ♀, ♂.

Taxonomy: Atwood, 1934. Canad. Jour. Res. 10: 207, 210. ♀, ♂ (key). —Lanham, 1941. Ent. Soc. Amer., Ann. 34: 705, 706, 708. ♀, ♂ (key). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 167-168, figs. 30-32, table 4 (redescription). —Ribble, 1968. Nebr. Univ. State Mus., Bul. 8: 309-313, figs. 64-68, map 7 (redescription).

Biology: Salt, 1927. Jour. Expt. Zool. 48: 252 (stylopization).

Taxonomy: Ribble, 1968. Nebr. Univ. State Mus., Bul. 8: 311-312, table 9 (stylopization, floral relationships).

**ziziae** Robertson. New England to Ga., west to Man., N. Dak., S. Dak., Nebr., Kans. and N. Mex. Parasite: *Imparipes* sp. Pollen: Polylectic although nearly all floral records are from *Zizia* including *Z. aptera*, *Z. aurea*, but visits other flowers including *Amorpha fruticosa*, *Aruncus dioicus*, *Barbarea vulgaris*, *Ceanothus ovatus*, *Echinacea angustifolia*, *Hieracium*, *Pastinaca sativa*, *Polytaenia nuttallii*, *Rudbeckia amplexicaulis*, *Sanicula marilandica*, *Taenidia integerrima*, *Thaspium barbinode*, *T. trifoliatum*.

*Andrena ziziae* Robertson, 1891. Amer. Ent. Soc., Trans. 18: 55. ♀, ♂.

*Andrena (Micrandrena) vernalis* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 168, fig. 29. ♀.

Taxonomy: Robertson, 1902. Amer. Ent. Soc., Trans. 28: 193. ♀, ♂ (key). —Cockerell, 1932. Canad. Ent. 64: 157, 158. ♀, ♂ (key). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141:

168-169, figs. 31-32, table 4 (redescription). — Ribble, 1968. Nebr. Univ. State Mus., Bul. 8: 267-271, figs. 26-30, map 1 (redescription, synonymy).

Biology: Ribble, 1968. Nebr. State Mus., Bul. 8: 270, table 3 (floral relationships, parasite).

#### Genus *ANDRENA* Subgenus *NEMANDRENA* LaBerge

*Andrena* subg. *Nemandrena* LaBerge, 1971. Pan-Pacific Ent. 47: 48.

Type-species: *Andrena torulosa* LaBerge. Orig. desig.

Revision: LaBerge, 1971. Pan-Pacific Ent. 47: 47-57, 15 figs. (N. Amer. spp.).

Biology: Cruden, 1972. Evolution 26: 373-389, 8 figs., 9 tables (floral relationships). — Cruden, 1972. Madrono 21: 505-515, 2 tables (floral relationships).

**crudeni** LaBerge. Calif. Pollen: Apparently oligolectic on flowers of *Nemophila* including *N. maculata*, *N. menziesii menziesii*.

*Andrena* (*Nemandrena*) *crudeni* LaBerge, 1971. Pan-Pacific Ent. 47: 54, figs. 6-10. ♀, ♂.

**subnigripes** Viereck. Calif. Pollen: Collects pollen from flowers of *Nemophila menziesii menziesii*.

*Andrena* (*Andrena*) *subnigripes* Viereck, 1916. Acad. Nat. Sci. Phila., Proc. 68: 581. ♀.

**torulosa** LaBerge. Oreg., Calif. Pollen: Apparently oligolectic on flowers of *Nemophila* including *N. menziesii atomeria*, *N. m. liniflora*, *N. m. menziesii*, but visits other flowers presumably for nectar including *Arctostaphylos*, *Limnanthes douglasii*, *Platystemon californica*.

*Andrena* (*Nemandrena*) *torulosa* LaBerge, 1971. Pan-Pacific Ent. 47: 49, figs. 1-5. ♀, ♂.

#### Genus *ANDRENA* Subgenus *OLIGANDRENA* Lanham

*Andrena* subg. *Oligandrena* Lanham, 1949. Calif. Univ. Pubs. Ent. 8: 207.

Type-species: *Andrena macrocephala* Cockerell. Orig. desig.

Taxonomy: LaBerge, 1964. Nebr. Univ. State Mus., Bul. 4: 284, 290, 301 (tax. characters).

**angelesia** Timberlake. South. Calif. Pollen: Unknown, but visits flowers of *Cryptantha intermedia*, *Encelia farinosa*, *Platystemon californicus*.

*Andrena* (*Oligandrena*) *angelesia* Timberlake, 1951. U. S. Natl. Mus., Proc. 101: 404. ♀, ♂.

**anisochlora** Cockerell. Oreg., Calif. Pollen: Unknown, but visits flowers of *Amsinckia douglasiana*, *Claytonia spathulata*, *Lasthenia*, *Montia perfoliata*, *Nemophila heterophylla*.

*Andrena anisochlora* Cockerell, 1936. Pan-Pacific Ent. 12: 137. ♀.

*Andrena* (*Micrandrena*) *dinognatha* Timberlake, 1938. Pan-Pacific Ent. 14: 26. ♂.

Taxonomy: Timberlake, 1951. In Linsley, In Muesebeck, Krombein and Townes, U. S. Dept. Agr., Agr. Monog. 2: 1056 (synonymy).

**macrocephala macrocephala** Cockerell. Calif. (lowlands); Mexico (Baja California). Parasite: *Styllops timberlakei* Bohart. Pollen: Collects pollen from flowers of *Nemophila* including *N. menziesii*, *N. integrifolia* as well as *Pholistoma auritum*, but visits other flowers presumably for nectar including *Calandrinia ciliata*, *Cryptantha intermedia*, *Eriogonum fasciculatum*, *Erodium*, *Gilia*, *Orthocarpus densiflorus*, *Phacelia distans*, *Ranunculus*, *Rhus trilobata*, *Sisymbrium irio*.

*Andrena macrocephala* Cockerell, 1916. Ann. and Mag. Nat. Hist. (8) 17: 278. ♂.

*Andrena peratra* Cockerell, 1916. Pomona Jour. Ent. Zool. 7: 46. ♀.

Taxonomy: Linsley, 1938. Calif. Acad. Sci., Proc. (4) 23: 281. ♀, ♂ (synonymy, floral relationships, parasite).

Biology: Cruden, 1972. Evolution 26: 378-380, fig. 7, tables 3, 4 (floral relationships).

— Cruden, 1972. Madrono 21: 505-515, 1 fig. 2 tables (floral relationships).

**macrocephala tetleyi** Linsley. South. Calif. (montane). Pollen: Collects pollen from flowers of *Nemophila integrifolia*.

*Andrena macrocephala tetleyi* Linsley, 1938. Calif. Acad. Sci., Proc. (4) 23: 282. ♀.

Biology: Cruden, 1972. Evolution 26: 379 (floral relationships). —Cruden, 1972. Madrono 21: 511 (floral relationships).

**nigroclypeata** Linsley. Calif. Pollen: Unknown, but visits flowers of *Lasthenia*, *Layia platyglossa*, *Marah*, *Phacelia alba*, *Platystemon californicus*, *Pholistoma racemosa*, *Raphanus sativa*, *Tamarix*.

*Andrena nigroclypeata* Linsley, 1939. Pan-Pacific Ent. 15: 155. ♀, ♂.

### Genus ANDRENA Subgenus ONAGRANDRENA Linsley and MacSwain

*Andrena* subg. *Onagrandrena* Linsley and MacSwain, 1956. Pan-Pacific Ent. 32: 111.

Type-species: *Andrena oenotherae* Timberlake. Orig. desig.

The species of this subgenus are chiefly dependent upon the pollen and nectar of several genera within the family Onagraceae, especially *Camissonia*, *Clarkia*, and *Oenothera*. These bees are largely or entirely dark or black in coloration and their behavior is usually closely synchronous with the diurnal flowering regimes of their host plants. Thus some of these bees are matinal species while others are active at the flowers only in the late afternoon and early evening and still others are active at the flowers both in the early morning and again in the late afternoon and early evening hours.

Taxonomy: Linsley and MacSwain, 1955. Pan-Pacific Ent. 31: 163-172 (as *Melandrena*).

—Linsley and MacSwain, 1956. Pan-Pacific Ent. 32: 111-114 (tax. characters, included spp.).

—Linsley and MacSwain, 1961. Pan-Pacific Ent. 37: 117-130 (*Oenothera* and *Clarkia* visiting spp.). —Linsley and MacSwain, 1962. Pan-Pacific Ent. 38: 49-52 (new spp. from Calif., Nev., Wyo.). —Linsley and MacSwain, 1963. Pan-Pacific Ent. 39: 189-198 (*oenotherae* complex). —Linsley, MacSwain and Raven, 1963. Calif. Univ. Pubs. Ent. 33: 5-6 (key to Colorado Desert spp.). —Linsley, MacSwain and Raven, 1963. Calif. Univ. Pubs. Ent. 33: 31 (key to Great Basin spp.). —Linsley, MacSwain and Raven, 1964. Calif. Univ. Pubs. Ent. 33: 64-65 (key to Mojave Desert spp.). —LaBerge, 1964. Nebr. Univ. State Mus., Bul. 4: 284, 287, 290, 292, 315 (tax. characters). —Linsley, MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 71: 27 (key to cismontane Calif. and Baja California spp.).

Biology: Linsley, MacSwain and Smith, 1955. Pan-Pacific Ent. 31: 173-185 (nesting habits, flower relationships). —Linsley and MacSwain, 1956. Pan-Pacific Ent. 32: 114-121 (nesting habits, floral relationships). —Linsley, MacSwain and Raven, 1963. Calif. Univ. Pubs. Ent. 33: 1-58, 6 plates, 6 text figs., 19 tables (comparative behavior of *Oenothera* visiting spp. on the Colorado Desert and Great Basin). —Linsley, MacSwain and Raven, 1964. Calif. Univ. Pubs. Ent. 33: 59-98, 3 plates, 17 tables (comparative behavior of *Oenothera* visiting spp. on the Mojave Desert). —MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 70: 1-80, 3 plates, 10 text figs., 18 tables (comparative behavior of *Clarkia* visiting spp. in western U. S.). —Linsley, MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 71: 1-68, 6 plates, 15 text figs., 10 tables (comparative behavior of *Camissonia* and *Oenothera* visiting spp. in cismontane Calif. and Baja California).

**anograe** *anograe* Cockerell. Calif., Colo. Wyo. Pollen: Collects pollen from *Oenothera caespitosa*, but visits other onagraceous flowers including *Anogra*, *Oenothera albicaulis*, *O. caespitosa* var. *montana*, and may collect pollen from these as well as the large white flowered evening primroses of the subgenus *Pachylophus*.

*Andrena anograe* Cockerell, 1901. Canad. Ent. 33: 154. ♀.

*Andrena micranthophila* Cockerell, 1906. Amer. Mus. Nat. Hist., Bul. 22: 432. ♀, ♂.

Taxonomy: Cockerell, 1934. Amer. Mus. Novitates 697: 2 (tax. characters). —Linsley and MacSwain, 1955. Pan-Pacific Ent. 31: 166 (synonymy, geogr. records). —Linsley and MacSwain, 1961. Pan-Pacific Ent. 37: 126 (changed status). —Linsley, MacSwain, and Raven, 1963. Calif. Univ. Pubs. Ent. 33: 31 (tax. characters).

Biology: Linsley, MacSwain and Raven, 1963. Calif. Univ. Pubs. Ent. 33: 39 (floral relationships).

**anograe knowltoni** Linsley and MacSwain. Utah. Pollen: Unknown, but visits flowers of *Camissonia scapoidea scapoidea*, *Stanleya pinnata*.

*Andrena (Onagrandrena) anograe knowltoni* Linsley and MacSwain, 1961. Pan-Pacific Ent. 37: 126. ♀.



- Biology:** Linsley, MacSwain and Raven, 1963. Calif. Univ. Pubs. Ent. 33: 39 (floral relationships).
- bernardina** Linsley. Calif. (San Bernardino Mts.). Pollen: Possibly oligolectic on *Clarkia*, but visits other flowers for nectar including *Potentilla glandulosa*.  
*Andrena bernardina* Linsley, 1938. Calif. Acad. Sci., Proc. (4) 23: 275. ♀, ♂.
- Taxonomy:** Linsley and MacSwain, 1955. Pan-Pacific Ent. 31: 166 (tax. status). — Linsley and MacSwain, 1961. Pan-Pacific Ent. 37: 128 (tax. status).
- Biology:** MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 70: 16, fig. 2, table 6 (floral relationships).
- blaisdelli** Cockerell. South. Calif. Pollen: Principal source of pollen is *Camissonia campestris*, but also collects pollen from *C. bistorta*, *C. californica*, *C. contorta*; visits these and other flowers for nectar including *Cryptantha intermedia*, *Eriophyllum confertiflorum*.  
*Andrena blaisdelli* Cockerell, 1924. Pan-Pacific Ent. 1: 59. ♀.
- Taxonomy:** Linsley, 1938. Calif. Acad. Sci., Proc. (4) 23: 266, 267. ♀, ♂ (key). — Linsley, MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 71: 27 (key).
- Biology:** Linsley, MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 71: 27-29, fig. 12 (floral relationships).
- boronensis** Linsley and MacSwain. Calif. (Mojave Desert). Parasite: *Stylops* sp. Pollen: Collects pollen almost exclusively from the flowers of *Camissonia campestris*, but has been observed collecting pollen from the flowers of *C. clavaeformis* and *C. kernensis*; nectar requirements are chiefly satisfied at the flowers of *C. campestris*, but other flowers are visited for nectar including *Baccharis viminea*, *Camissonia bistorta*, *Cryptantha intermedia*, *Encelia farinosa*, *Eriophyllum confertiflorum*, *Layia glandulosa*, *Potentilla*, *Salix lasiolepis*.  
*Andrena (Onagrandrena) boronensis* Linsley and MacSwain, 1962. Pan-Pacific Ent. 38: 49. ♀, ♂.
- Taxonomy:** Linsley, MacSwain and Raven, 1964. Calif. Univ. Pubs. Ent. 33: 64, 65, 69 (key, identity).
- Biology:** Linsley, MacSwain and Raven, 1964. Calif. Univ. Pubs. Ent. 33: 69-71, tables 3-4, 7-15 (nest architecture, male behavior, floral relationships, parasite).
- camissoniae** Linsley and MacSwain. Calif. (Santa Barbara County). Pollen: Apparently obtains pollen from the flowers of *Camissonia campestris*.  
*Andrena (Onagrandrena) camissoniae* Linsley and MacSwain, 1968. Pan-Pacific Ent. 44: 144. ♀.
- Taxonomy:** Linsley, MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 71: 27, 29 (key, tax. characters).
- Biology:** Linsley, MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 71: 29 (floral relationship).
- chylismiae** Linsley and MacSwain. Calif. (Owens Valley), Nev. Parasite: *Nomada* sp., *Stylops* sp. Pollen: Collects pollen from the flowers of *Camissonia clavaeformis cruciformis* and *C. c. integrifolia*, but visits these and other flowers for nectar including *Haplopappus acaulis*, *Sisymbrium altissimum*, *Stanleya pinnata*, *Taraxacum officinale*.  
*Andrena (Onagrandrena) chylismiae* Linsley and MacSwain, 1961. Pan-Pacific Ent. 37: 121. ♀, ♂.
- Taxonomy:** Linsley, MacSwain and Raven, 1963. Calif. Univ. Pubs. Ent. 33: 31 (key).
- Biology:** Linsley, MacSwain and Raven, 1963. Calif. Univ. Pubs. Ent. 33: 37-38, fig. 6, tables 16, 17, 19 (floral relationships, parasites).
- convallaria convallaria** Linsley and MacSwain. Calif. (Central Valley and south. cent. Coast Ranges). Pollen: Collects pollen principally from the flowers of *Camissonia campestris* although occasionally obtains pollen from the flowers of *C. californica*, *C. cheiranthifolia*, *C. c. obispoensis*, *C. contorta*, *C. sierrae*; visits these and other flowers

for nectar including *Brassica*, *Camissonia micrantha*, *Encelia actoni*, *Isomeris arborea*, *Lasthenia*, *Lupinus*, *Malacothrix*.

*Andrena (Onagrandrena) convallaria convallaria* Linsley and MacSwain, 1963.

Pan-Pacific Ent. 39: 193. ♀, ♂.

Taxonomy: Linsley, MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 71: 27 (key).

Biology: Linsley, MacSwain, Raven and Thorp, 1973. Univ. Calif. Pubs. Ent. 71: 29-31, fig. 13, tables 1, 3-8 (floral relationships).

**convallaria subhyalina** Linsley and MacSwain. Calif. (west. margin Mojave Desert). Parasite:

*Stylops* sp. Pollen: Collects pollen almost exclusively from the flowers of *Camissonia campestris* although occasionally obtains pollen from the flowers of *C. abramsii*; visits these and other flowers for nectar including *Aniscoma acaulis*, *Camissonia clavaeformis*, *Coreopsis bigelovii*, *C. californica*, *Layia californica*.

*Andrena (Onagrandrena) convallaria subhyalina* Linsley and MacSwain, 1963. Pan-Pacific Ent. 39: 193. ♀, ♂.

Biology: Linsley, MacSwain and Raven, 1964. Calif. Univ. Pubs. Ent. 33: 71-72, tables 3, 11-12, 14 (mating, floral relationships, parasite).

**deserticola** Timberlake. Calif. (Mojave Desert). Parasite: *Nomada* sp., *Stylops* sp. Pollen:

Collects pollen almost exclusively from the flowers of *Camissonia campestris* although on one occasion collected pollen from the flowers of *C. kernensis*; visits these and other flowers for nectar including *Baileya multiradiata*, *Camissonia abramsii*, *C. clavaeformis*, *C. boothii decorticans*, *Coreopsis bigelovii*, *C. californica*, *Isomeris arborea*.

*Andrena deserticola* Timberlake, 1937. Pan-Pacific Ent. 12: 173. ♀.

Taxonomy: Linsley and MacSwain, 1955. Pan-Pacific Ent. 31: 172 (geogr. and floral records).

—Linsley, MacSwain and Raven, 1964. Calif. Univ. Pubs. Ent. 33: 64, 65 (key). —Linsley, MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 71: 27 (key).

Biology: Linsley, MacSwain and Smith, 1955. Pan-Pacific Ent. 31: 182-183 (nest architecture, parasites). —Linsley, MacSwain and Raven, 1964. Calif. Univ. Pubs. Ent. 33: 68-69, tables 3-4, 7-11, 15 (nest architecture, floral relationships, male behavior, parasite). —Linsley, MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 71: 31, table 1 (floral relationships).

**flandersi** Timberlake. South. Calif. (Mojave Desert). Pollen: Collects pollen from the flowers of *Camissonia campestris*, *C. clavaeformis*, *C. contorta*, *C. kernensis*, but visits these and other flowers for nectar including *Chaenactis*, *Coreopsis bigelovii*, *C. californica*, *Cryptantha*, *Ericameria*, *Lasthenia chrysostoma*, *Layia glandulosa*.

*Andrena flandersi* Timberlake, 1937. Pan-Pacific Ent. 12: 72. ♀.

Taxonomy: Linsley, 1938. Calif. Acad. Sci., Proc. (4) 23: 266, 278. ♀ (key). —Linsley and MacSwain, 1955. Pan-Pacific Ent. 31: 167 (geogr. and floral records). —Linsley, MacSwain and Raven, 1964. Calif. Univ. Pubs. Ent. 33: 64, 65 (key).

Biology: Linsley and MacSwain, 1956. Pan-Pacific Ent. 32: 118-120 (nest site, floral relationships). —Linsley, MacSwain and Raven, 1964. Calif. Univ. Pubs. Ent. 33: 72, tables 3, 7, 11-15 (floral relationships).

**furva** Linsley and MacSwain. South. Calif.; Mexico (Baja California). Pollen: Principally gathers pollen from *Camissonia campestris* although it has been observed gathering pollen from *Clarkia cylindrica* and occasionally with mixed pollen loads of *Camissonia* and *Clarkia*.

*Andrena (Onagrandrena) furva* Linsley and MacSwain, 1961. Pan-Pacific Ent. 37: 117. ♀.

Taxonomy: Linsley, MacSwain and Raven, 1964. Calif. Univ. Pubs. Ent. 33: 64, 73 (key, geogr. records). —Linsley, MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 71: 27 (key).

Biology: MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 70: 46 (floral relationships). —Linsley, MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 71: 32-33, fig. 15 (floral relationships).

- linsleyi** Timberlake. South. Calif., southeast. Nev.; Mexico (Baja California). Parasite: *Nomada* sp., *Stylops* sp. Pollen: Usually collects pollen from *Oenothera deltoides*, but occasionally takes pollen from *Camissonia clavaeformis* including *C. c. aurantiaca* *C. c. clavaeformis* and also occasionally from *C. decorticans desertorum*, *Oenothera trichocalyx*; visits these and other flowers for nectar including *Baileya*, *Dithyrea californica*, *Encelia*, *Geraea canescens*, *Hyptis emoryi*.  
*Andrena linsleyi* Timberlake, 1937. Pan-Pacific Ent. 12: 71. ♀.
- Taxonomy:** Linsley, 1938. Calif. Acad. Sci., Proc. (4) 23: 266. ♀ (key). — Linsley and MacSwain, 1955. Pan-Pacific Ent. 31: 165, 166, 170-171 (key, geogr. and floral records). — Linsley, MacSwain and Raven, 1963. Calif. Univ. Pubs. Ent. 33: 6 (key).
- Biology:** Linsley, MacSwain and Smith, 1955. Pan-Pacific Ent. 31: 176 (floral relationships). — Linsley, MacSwain and Raven, 1963. Calif. Univ. Pubs. Ent. 33: 11-16, fig. 2, tables 1, 3, 7-12 (floral relationships, parasites). — Linsley, MacSwain and Raven, 1964. Calif. Univ. Pubs. Ent. 3: 73 (floral relationships).
- mojavensis** Linsley and MacSwain. Calif. (Jawbone and Short Canyons, Kern County). Pollen: Principal pollen source is *Camissonia kernensis*, but also takes pollen from *C. campestris*, *C. clavaeformis*, *C. dentata johnstonii*, *C. d. parishii*; visits these and other flowers for nectar including *Coreopsis bigelovii*, *Dithyrea californica*, *Salix*.  
*Andrena (Melandrena) mojavensis* Linsley and MacSwain, 1955. Pan-Pacific Ent. 31: 171. ♀, ♂.
- Taxonomy:** Linsley and MacSwain, 1955. Pan-Pacific Ent. 31: 165 (key). — Linsley, MacSwain and Raven, 1964. Calif. Univ. Pubs. Ent. 33: 64, 65 (key).
- Biology:** Linsley, MacSwain and Smith, 1955. Pan-Pacific Ent. 31: 179-181 (nest architecture, floral relationships). — Linsley, MacSwain and Raven, 1964. Calif. Univ. Pubs. Ent. 33: 65-67, tables 5-10 (nest architecture, floral relationships, male behavior).
- nevadae** Linsley and MacSwain. Nev. (Eureka and White Pine Counties). Pollen: Unknown, presumably collects pollen from the flowers of the subgenera *Anogra* or *Pachylophus*; visits flowers of *Camissonia clavaeformis* and *Stanleya pinnata* for nectar.  
*Andrena (Onagrاندrena) nevadae* Linsley and MacSwain, 1961. Pan-Pacific Ent. 37: 125. ♀.
- Taxonomy:** Linsley, MacSwain and Raven, 1963. Calif. Univ. Pubs. Ent. 33: 31 (key).
- Biology:** Linsley, MacSwain and Raven, 1963. Calif. Univ. Pubs. Ent. 33: 39 (floral relationships).
- oenotherae** Timberlake. Calif. (Coastal Santa Barbara Co. east to Colorado Desert); Mexico (Baja California). Parasite: *Lytta stygica* (LeC.)?, *Meloe* sp., *Stylops* sp. Pollen: Principally collects pollen from the flowers of *Camissonia cheiranthifolia* *cheiranthifolia* on Santa Cruz Island, and *C. c. suffruticosa* along the mainland coast while more interior populations collect from *C. bistorta*; visits these and other flowers for nectar including *Cakile edentula*, *Calandrinia*, *Chaenactis*, *Chrysanthemum coronarium*, *Coreopsis californica*, *Croton californicus*, *Cryptantha intermedia*, *Eriogonum fasciculatum*, *Haplopappus cooperi*, *Hemizonia kelloggii*, *Lantana*, *Layia platyglossa*, *Lupinus*, *Salix lasiolepis*, *Sisymbrium*.  
*Andrena oenotherae* Timberlake, 1937. Pan-Pacific Ent. 12: 69. ♀, ♂.
- Taxonomy:** Linsley, 1938. Calif. Acad. Sci., Proc. (4) 23: 266, 267. ♀, ♂ (key). — Linsley and MacSwain, 1955. Pan-Pacific Ent. 31: 164, 166, 170 (key, geogr. and floral records). — Linsley and MacSwain, 1963. Pan-Pacific Ent. 39: 189-190. — Linsley, MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 71: 27 (key).
- Biology:** Linsley, MacSwain and Smith, 1955. Pan-Pacific Ent. 31: 181-182 (nest architecture, floral relationships, parasites). — Linsley and MacSwain, 1956. Pan-Pacific Ent. 32: 116-118, 1 fig. (nest architecture, floral relationships, parasite). — Linsley and MacSwain, 1963. Pan-Pacific Ent. 39: 189-190 (floral relationships). — Linsley, MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 71: 33-34, fig. 14, table 9 (floral relationships).

**omninigra clarkiae** Linsley and MacSwain. Calif. (Monterey and San Luis Obispo Counties).

Pollen: Collects pollen from the flowers of *Clarkia cylindrica*, *C. speciosa*.

*Andrena (Onagrandrena) omninigra clarkiae* Linsley and MacSwain, 1961. Pan-Pacific Ent. 37: 127. ♀, ♂.

Biology: MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 70: 15-16, fig. 1, tables 7-11 (floral relationships, mating behavior).

**omninigra omninigra** Viereck. Calif. (west. slopes of Sierra Nevada Mts.). Pollen: Collects pollen from the flowers of *Clarkia* including *C. biloba*, *C. cylindrica*, *C. dudleyana*, *C. purpurea quadrivulnera*, *C. rhomboidea*, *C. speciosa polyantha*, *C. unguiculata*, *C. xantiana*; visits these and other flowers for nectar including *Cryptantha flaccida*, *Gilia capitata*. Predator: *Callinicus calcanus* (Loew).

*Andrena (Andrena) omninigra* Viereck, 1917. Amer. Ent. Soc., Trans. 43: 385. ♀.

*Andrena grundeli* Linsley, 1938. Calif. Acad. Sci., Proc. (4) 23: 274. ♀, ♂.

Taxonomy: Linsley, 1938. Calif. Acad. Sci., Proc. (4) 23: 265. ♀ (key). — Linsley and MacSwain, 1955. Pan-Pacific Ent. 31: 164, 165, 166 (key, geogr. records). — Linsley and MacSwain, 1961. Pan-Pacific Ent. 37: 27 (type).

Biology: Linsley, 1972. Pan-Pacific Ent. 48: 94-96 (predator). — MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 70: 14, fig. 1, tables 1, 6-9, 13-18 (floral relationships).

**oraria actitis** Linsley and MacSwain. Calif. (San Francisco). Pollen: Collects pollen from the flowers of *Camissonia cheiranthifolia cheiranthifolia*.

*Andrena (Onagrandrena) oraria actitis* Linsley and MacSwain, 1963. Pan-Pacific Ent. 39: 196. ♀, ♂.

Biology: Linsley, MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 71: 35, fig. 15 (floral relationship).

**oraria oraria** Linsley and MacSwain. Calif. (Marin and Sonoma Counties). Pollen: Collects pollen from the flowers of *Camissonia* including *C. cheiranthifolia cheiranthifolia*, *C. ovata*.

*Andrena (Onagrandrena) oraria oraria* Linsley and MacSwain, 1963. Pan-Pacific Ent. 39: 196. ♀, ♂.

Biology: Linsley, MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 71: 35, fig. 15 (floral relationships).

**raveni** Linsley and MacSwain. Oreg., Calif., Nev., Utah. Parasite: *Nomada* sp., *Stylops* sp.

Pollen: Collects pollen from the flowers of *Camissonia clavaeformis clavaeformis*, *C. c. integrrior*, *C. tanacetifolia*, *Oenothera deltoidea piperi*, but visits these and other flowers for nectar including *Agoseris*, *Madia*, *Stanleya pinnata*, *Taraxacum officinale*.

*Andrena (Onagrandrena) raveni* Linsley and MacSwain, 1961. Pan-Pacific Ent. 37: 118. ♀, ♂.

Taxonomy: Linsley, MacSwain and Raven, 1963. Calif. Univ. Pubs. Ent. 33: 31 (key).

Biology: Linsley, MacSwain and Raven, 1963. Calif. Univ. Pubs. Ent. 33: 31-36, fig. 4, tables 14-19 (nest architecture, floral relationships, parasites).

**rozeni** Linsley and MacSwain. Ariz., south. Calif., Nev.; Mexico (Baja California), deserts.

Parasite: *Nomada* sp., *Stylops* sp. Pollen: Collects pollen from the flowers of *Camissonia* including *C. clavaeformis aurantiaca*, *C. c. clavaeformis*, *C. c. integrrior*, *C. c. peirsonii*, *C. decorticans*, *C. latifolia*, *C. tanacetifolia*, *C. trichocalyx* and *Oenothera deltoidea piperi*; visits these and other flowers for nectar including *Agoseris glauca*, *Brassica*, *Cryptantha clevelandii*, *C. intermedia*, *Encelia farinosa*, *Geraea canescens*, *Madia ramii*, *Mirabilis*, *Sisymbrium altissimum*, *Stanleya pinnata*, *Taraxacum officinale*.

*Andrena (Melandrena) rozeni* Linsley and MacSwain, 1955. Pan-Pacific Ent. 31: 168. ♀, ♂.

Taxonomy: Linsley, MacSwain and Raven, 1963. Calif. Univ. Pubs. Ent. 33: 5, 31 (key).

— Linsley, MacSwain and Raven, 1964. Calif. Univ. Pubs. Ent. 33: 64, 65 (key).

Biology: Linsley, MacSwain and Raven, 1963. Calif. Univ. Pubs. Ent. 33: 6-11, 36-37, figs. 1, 5, tables 1-6, 17-18 (nest architecture, floral relationships, male behavior, parasites).

- Linsley, MacSwain and Raven, 1964. Calif. Univ. Pubs. Ent. 33: 72-73, table 16 (floral relationships).
- rubrotincta** Linsley. South. Calif., northwest. Ariz., south. Nev., southwest. Utah. Pollen: Collects pollen regularly only from *Camissonia brevipes pallidula* and *C. parryi*, although females have been taken at flowers of *C. brevipes brevipes* and *C. clavaeformis aurantiaca* with pollen in their scopae.  
*Andrena rubrotincta* Linsley, 1938. Calif. Acad. Sci., Proc. (4) 23: 278. ♀.
- Taxonomy: Linsley and MacSwain, 1955. Pan-Pacific Ent. 31: 165, 170 (key, geogr. records).  
—Linsley, MacSwain and Raven, 1963. Calif. Univ. Pubs. Ent. 33: 5, 6 (key).
- Biology: Linsley, MacSwain and Raven, 1963. Calif. Univ. Pubs. Ent. 33: 16-18, fig. 3, table 13 (floral relationships).
- stagei** Linsley and MacSwain. Wyo. (Sweetwater Co.). Pollen: Collects pollen from the flowers of *Oenothera trichocalyx*.  
*Andrena (Onagrandrena) stagei* Linsley and MacSwain, 1962. Pan-Pacific Ent. 38: 52. ♀.
- Taxonomy: Linsley, MacSwain and Raven, 1963. Calif. Univ. Pubs. Ent. 33: 31 (key).
- Biology: Linsley, MacSwain and Raven, 1963. Calif. Univ. Pubs. Ent. 33: 38 (floral relationships).
- thorpi** Linsley and MacSwain. Nev. (Humboldt Co.). Parasite: *Stylops* sp. Pollen: Collects pollen from the flowers of *Oenothera deltoides piperi*.  
*Andrena (Onagrandrena) thorpi* Linsley and MacSwain, 1962. Pan-Pacific Ent. 38: 51. ♀.
- Taxonomy: Linsley, MacSwain and Raven, 1963. Calif. Univ. Pubs. Ent. 33: 31 (key).
- Biology: Linsley, MacSwain and Raven, 1963. Calif. Univ. Pubs. Ent. 33: 38-39, table 15 (floral relationships, parasite).
- vanduzeei** Linsley. Calif. Pollen: Possibly an oligolege of *Gayophytum*.  
*Andrena vanduzeei* Linsley, 1938. Calif. Acad. Sci., Proc. (4) 23: 280. ♀, ♂.
- Taxonomy: Linsley and MacSwain, 1955. Pan-Pacific Ent. 31: 165, 166, 172 (key, geogr. records).
- vespertina** Linsley and MacSwain. Calif. (Kern and Stanislaus Counties). Pollen: Collects pollen only from the flowers of *Camissonia boothii decorticans*; visits flowers of *Isomeris arborea* for nectar.  
*Andrena (Onagrandrena) vespertina* Linsley and MacSwain, 1961. Pan-Pacific Ent. 37: 123. ♀, ♂.
- Taxonomy: Linsley, MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 71: 27 (key).
- Biology: Linsley, MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 71: 35-36, fig. 15, table 10 (floral relationships).
- yumorum** Viereck. South. Calif.  
*Andrena (Andrena) yumorum* Viereck, 1916. Acad. Nat. Sci. Phila., Proc. 68: 585. ♂.
- Taxonomy: Linsley and MacSwain, 1961. Pan-Pacific Ent. 37: 128-129 (type).

#### Genus ANDRENA Subgenus OPANDRENA Robertson

- Opandrena* Robertson, 1902. Amer. Ent. Soc., Trans. 28: 193.  
Type-species: *Andrena cressonii* Robertson. Orig. desig.
- Taxonomy: Lanham, 1949. Calif. Univ. Pubs. Ent. 8: 210 (tax. characters). —LaBerge, 1964. Nebr. Univ. State Mus., Bul. 4: 284, 289, 303 (tax. characters).
- cressonii** *cressonii* Robertson. U. S. and southern Canada. Pollen: Apparently polylectic, visits a wide variety of flowers including *Amelanchier*, *Anemonella*, *Arabis*, *Aronia*, *Aruncus*, *Brassica*, *Capsella*, *Ceanothus*, *Celastrus*, *Claytonia*, *Cornus*, *Crataegus*, *Dentaria*, *Fragaria*, *Heracleum*, *Ilex*, *Oxalis*, *Pastinaca*, *Philadelphus*, *Polytaenia*, *Potentilla*, *Prunus*, *Ptelea*, *Pyracantha*, *Radicula*, *Ranunculus*, *Rhamnus*, *Rhus*, *Rosa*, *Rubus*, *Salix*, *Sanicula*, *Sisymbrium*, *Smilacina*, *Smilax*, *Stellaria*, *Taenidia*, *Taraxacum*, *Thaspium*, *Tradescantia*, *Trifolium*, *Veronica*, *Viburnum*, *Zanthoxylum*, *Zizia*.  
*Andrena Cressonii* Robertson, 1891. Amer. Ent. Soc., Trans. 18: 56. ♀, ♂.

*Andrena kansensis* Cockerell, 1899. Ent. News 10: 255. ♂.

*Andrena bridwelli* Cockerell, 1899. Ent. News 10: 255. ♂.

*Andrena dubia* Robertson, 1902. Canad. Ent. 34: 48. ♂.

*Andrena (Trachandrena) trumani* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 12. ♀.

*Andrena latisigna* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 22. ♂.

*Andrena cressoni transformans* Cockerell, 1934. Pan-Pacific Ent. 9: 157. ♀.

Taxonomy: Robertson, 1902. Amer. Ent. Soc., Trans. 28: 193. ♀, ♂ (key). — Lanham, 1949.

Pan-Pacific Ent. 25: 147 (tax status). — Timberlake and Lanham, 1951. In Linsley, In

Muesebeck, Krombein and Townes, U. S. Dept. Agr., Agr. Monog. 2: 1063 (synonymy).

— Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 248-249, figs. 50, 52-54

(redescription).

**cressonii infasciata** Lanham. Calif., Oreg., Wash. Pollen: Presumably gathers pollen from *Gilia*, but visits other flowers for nectar including *Brassica campestris*, *Ranunculus californicus*, *Pyraecantha*, *Salix lasiolepis*, *S. nigra*.

*Andrena cressonii infasciata* Lanham, 1949. Pan-Pacific Ent. 25: 147. ♀, ♂.

Biology: Linsley and MacSwain, 1959. Calif. Univ. Pubs. Ent. 16: 19 (floral relationships).

**cressonii ivanensis** Mitchell. Va., N. C. Pollen: Unknown, but visits flowers of *Brassica*, *Padus*.

*Andrena (Opandrena) cressonii ivanensis* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 249, fig. 52. ♂.

**cressonii tallahasseeensis** Mitchell. Fla., N. C. Pollen: Unknown, but visits flowers of *Castanea pumila*.

*Andrena (Opandrena) cressonii tallahasseeensis(!)* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 249, figs. 50, 53. ♂.

*Andrena (Opandrena) cressonii tallahasseeensis* Mitchell, 1967. In Krombein and Burks, U. S. Dept. Agr., Agr. Monog. 2, Second Suppl., p. 428. Emend.

**prunifloris** Cockerell. N. Mex. Pollen: Unknown, but visits flowers of *Prunus*.

*Andrena prunifloris* Cockerell, 1898. Canad. Ent. 30: 147. ♀.

Taxonomy: Cockerell, 1898. Denison Univ. Sci. Labs., Bul. 11: 49. ♀. (key).

### Genus ANDRENA Subgenus PARANDRENA Robertson

*Parandrena* Robertson, 1897. Acad. Sci. St. Louis, Trans. 7: 337.

Type-species: *Panurgus andrenoides* Cresson. Desig. by Cockerell, 1897.

The species of this Nearctic subgenus are apparently oligoleges of *Salix*.

Revision: LaBerge and Ribble, 1972. Amer. Ent. Soc., Trans. 98: 307-346, figs. 5-9, 41-70 (N. Amer. spp.).

Taxonomy: Lanham, 1949. Calif. Univ. Pubs. Ent. 8: 202 (tax. characters). — LaBerge, 1964. Nebr. Univ. State Mus., Bul. 4: 298 (tax. characters).

**andrenoides** (Cresson). South. Canada (B. C., Sask., Man. and Ont.), south to Fla., Tex., N.

Mex. and Utah. Pollen: Oligolege of *Salix* including *S. amygdaloides*, *S. cordata*, *S. interior*, *S. nigra*, but visits these and other flowers for nectar including *Amelanchier canadensis*, *Anemone patens*, *Antennaria plantaginifolia*, *Crataegus crus-galli*, *Erigenia bulbosa*, *Heracleum maximum*, *Lomatium foeniculaceum*, *Prunus americana*, *P. angustifolia*, *P. gracilis*, *Pyrus*, *Rubus*, *Sassafras variifolium*, *Sisymbrium*, *Stellaria media*, *Viola*.

*Panurgus andrenoides* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 62. ♂.

*Panurgus rufocinctus* Ashmead, 1890. Colo. Biol. Assoc., Bul. 1: 4. ♀.

*Andrena andrenoides* f. *bicolor* Robertson, 1898. Acad. Sci. St. Louis, Trans. 8: 47. Preocc.

*Parandrena andrenoides* var. *clarigastra* Viereck, 1908. Ent. News 19: 42. N. name.

Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 238-239, figs. 49-50, 52, 55, table 6 (redescription).

Biology: Salt, 1927. Jour. Exp. Zool. 48: 250 (stylopization).

- arenicola** LaBerge and Ribble. Kans., Okla., Tex. Pollen: Apparently an oligolege of *Salix* including *S. amygdaloides*, *S. longifolia*, *S. nigra*, but visits other flowers including *Pyrus pyrus*.  
*Andrena* (*Parandrena*) *arenicola* LaBerge and Ribble, 1972. Amer. Ent. Soc., Trans. 98: 328, figs. 7, 53-54. ♀, ♂.
- Biology: LaBerge and Ribble, 1972. Amer. Ent. Soc., Trans. 98: 330 (stylopization).
- bucculenta** LaBerge and Ribble. Calif. Pollen: Presumably an oligolege of *Salix*, but visits other flowers including *Eschscholzia californica*, *Layia platyglossa*, *Prunus*.  
*Andrena* (*Parandrena*) *bucculenta* LaBerge and Ribble, 1972. Amer. Ent. Soc., Trans. 98: 334, figs. 6, 60-61. ♀, ♂.
- concinnulla** (Cockerell). Oreg., Calif., Ariz. (Chiricahua Mts.). Pollen: Oligolege of *Salix* including *S. argophylla*, *S. cordata*, *S. exigua*, *S. gooddingii*, *S. hindsiana*, *S. laevigata*, *S. lasiolepis*, but visits other flowers presumably for nectar including *Amsinckia douglasiana*, *Capsella bursa-pastoris*, *Eschscholzia californica*, *Gilia*, *Sambucus*, *Spiraea prunifolia*, *Tamarix gallica*.  
*Parandrena concinnulla* Cockerell, 1898. Amer. Ent. Soc., Trans. 25: 189. ♂.  
*Andrena* (*Parandrena*) *mendosa* Viereck, 1916. Acad. Nat. Sci. Phila., Proc. 68: 588. ♀.
- Taxonomy: LaBerge and Ribble, 1972. Amer. Ent. Soc., Trans. 98: 331-334, figs. 8, 55-59 (redescription, synonymy).
- gibberis** Viereck. B. C. (Fairview), Oreg. (Irrigon), Calif. (Lassen and Mono Counties), Nev. (Elko), Utah (Cedar City). Pollen: Presumably an oligolege of *Salix*.  
*Andrena* (*Parandrena*) *gibberis* Viereck, 1924. Canad. Ent. 56: 241. ♀, ♂.
- nevadensis** (Cresson). B. C. to Calif., Nev. and Utah. Pollen: Presumably an oligolege of *Salix*, but visits other flowers including *Acer*, *Ribes*, *Senecio*, *Tamarix*.  
*Panurgus nevadensis* Cresson, 1879. Amer. Ent. Soc., Trans. 7: 214. ♂.  
*Andrena* (*Parandrena*) *garretti* Viereck, 1924. Canad. Ent. 53: 243. ♂.  
*Andrena* (*Parandrena*) *triangularis* Viereck, 1924. Canad. Ent. 55: 243. ♀.
- Taxonomy: Cockerell, 1898. Amer. Ent. Soc., Trans. 25: 188. ♂. — LaBerge and Ribble, 1972. Amer. Ent. Soc., Trans. 98: 341-344, figs. 7, 67-68 (redescription, synonymy).
- nida** Mitchell. Vt. to Ga., west to Mich., Ill., Mo. and Miss. Pollen: Presumably an oligolege of *Salix* including *S. interior*, but visits other flowers including *Amelanchier*, *Crataegus*, *Prunus*, *Rubus*, *Viola*.  
*Andrena* (*Parandrena*) *nida* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 240, figs. 49, 50, 52, 55. ♀, ♂.
- Taxonomy: LaBerge and Ribble, 1972. Amer. Ent. Soc., Trans. 98: 321-324, fig. 7, 46-47 (redescription).
- papagorum** Viereck and Cockerell. Ariz., south. Calif., Utah. Pollen: Presumably an oligolege of *Salix*, visits flowers of *S. gooddingii*, *S. nigra*.  
*Andrena papagorum* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 2. ♀.
- Taxonomy: LaBerge and Ribble, 1972. Amer. Ent. Soc., Trans. 98: 338-341, figs. 9, 62-66 (redescription).
- wellesleyana** Robertson. Mass. and Conn., west to N. W. T., Alta., and Utah. Pollen: Unknown, but visits flowers of *Prunus virginiana*, *Salix*.  
*Andrena wellesleyana* Robertson, 1897. Acad. Sci. St. Louis, Trans. 7: 337. ♀, ♂.
- Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 241-242, figs. 50, 52, 55, table 6 (redescription). — LaBerge and Ribble, 1972. Amer. Ent. Soc., Trans. 98: 325-328, figs. 8, 42-52 (redescription).

#### Genus ANDRENA Subgenus PELICANDRENA LaBerge and Ribble

*Andrena* subg. *Pelicanandrena* LaBerge and Ribble, 1972. Amer. Ent. Soc., Trans. 98: 346.  
 Type-species: *Parandrena atypica* Cockerell. Monotypic and orig. desig.

Revision: LaBerge and Ribble, 1972. Amer. Ent. Soc., Trans. 98: 346-351, figs. 71-76.

*atypica* (Cockerell). Oreg. (Klamath Falls), Calif.; Mexico (Baja California). Pollen: Apparently polylectic with some preference for flowers of *Cryptantha*, *Salix*, *Rhus*, *Rhamnus* and *Ceanothus* in approximately that order; visitation records include *Adenostoma fasciculatum*, *Allium haematociton*, *Arctostaphylos bicolor*, *Baccharis*, *Brassica*, *Ceanothus crassifolius*, *C. cuneatus*, *C. greggii*, *C. soredatus*, *C. verrucosus*, *Cryptantha intermedia*, *Emmenanthe penduliflora*, *Gilia capitata*, *G. multicaulis*, *Lomatium dasycarpum*, *Marah macrocarpus*, *Oenothera*, *Plagiobothrys nothofulvus*, *Prunus ilicifolia*, *Quercus*, *Rhamnus californica*, *R. crocea*, *Rhus diversiloba*, *R. integrifolium*, *R. ovata*, *R. trilobata*, *Rosa minutiflora*, *Salix argophylla*, *Salvia columbariae*, *S. mellifera*, *Tamarix gallica*.

*Parandrena atypica* Cockerell, 1941. San Diego Soc. Nat. Hist., Trans. 9: 347. ♀.

Taxonomy: Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 123 (tax. characters and status).

#### Genus ANDRENA Subgenus PLASTANDRENA Hedicke

*Andrena* subg. *Plastandrena* Hedicke, 1933. Berlin Zool. Mus., Mitt. 19: 217.

Type-species: *Melitta tibialis* Kirby. Orig. desig.

*Andrena* subg. *Schizandrena* Hedicke, 1933. Berlin Zool. Mus., Mitt. 19: 218.

Type-species: *Andrena aulica* Morawitz. Orig. desig.

Revision: LaBerge, 1969. Amer. Ent. Soc., Trans. 95: 2-34, figs. 1-23, 3 tables (N. Amer. spp.).

Taxonomy: Lanham, 1949. Calif. Univ. Pubs. Ent. 8: 201 (tax. characters, as *Schizandrena*).

—LaBerge, 1964. Nebr. Univ. State Mus., Bul. 4: 297 (tax. characters, synonymy).

*argemonis* Cockerell. Nebr. and Colo. south to N. Mex. and Ariz.; Mexico (Chihuahua, Coahuila, and Sonora south to Oaxaca). Pollen: Polylectic, visits flowers of *Acacia*, *Argemone mexicana*, *A. platyceras*, *Cleome serrulata*, *Medicago sativa*, *Melilotus alba*, *Penstemon occidentalis*, *Persicaria pennsylvanicus*, *Sisymbrium irio*.

*Andrena argemonis* Cockerell, 1896. Ann. and Mag. Nat. Hist. (6) 18: 80. ♂.

Taxonomy: Cockerell, 1898. Ann. and Mag. Nat. Hist. (7) 2: 449. ♀. —Cockerell, 1931. Amer.

Mus. Novitates 458: 16. ♀, ♂ (key). —Lanham, 1941. Ent. Soc. Amer., Ann. 34: 704, 707. ♀, ♂. —LaBerge, 1969. Amer. Ent. Soc., Trans. 95: 12-15, figs. 24-28 (redescription).

*crataegi* Robertson. Transcont. in southern Canada (N. S. to B. C.) and northern U. S., south to Ga., Ala., Ark., Tex., N. Mex., Utah, Nev. and north. Calif. Pollen: Polylectic with some preference for the flowers of the family Rosaceae, visits flowers of *Amelanchier*, *Amorpha*, *Aruncus*, *Astragalus*, *Barbarea*, *Blephilia*, *Brassica*, *Caragana*, *Cardaria*, *Carduus*, *Castanea*, *Ceanothus*, *Chamaebatia foliolosa*, *Chrysanthemum*, *Conium*, *Cornus*, *Crataegus*, *Crepis*, *Cryptantha intermedia*, *Daucus*, *Deutzia*, *Eulophus*, *Euphorbia*, *Fragaria*, *Frasera*, *Gilia achillaeifolia*, *Hackelia*, *Heracleum lanatum*, *Holodiscus*, *Hydrangea*, *Ilex*, *Iris*, *Ledum*, *Lomatium dasycarpum*, *Malvastrum*, *Melilotus*, *Monarda*, *Narcissus*, *Opulaster*, *Pastinaca*, *Philadelphus*, *Polytaenia*, *Potentilla*, *Prunus*, *Ptelea*, *Purshia*, *Pyracantha*, *Pyrus*, *Ranunculus*, *Raphanus*, *Rhamnus*, *Rhododendron*, *Rhus*, *Rorippa nasturtium-aquaticum*, *Rosa*, *Rubus*, *Salix*, *Senecio*, *Solidago*, *Sorbaria*, *Spiraea*, *Symphoricarpos*, *Taenidia*, *Tamarix*, *Taraxacum*, *Thaspium*, *Trifolium repens*, *Vaccinium*, *Viburnum*, *Zizia*.

*Andrena crataegi* Robertson, 1893. Amer. Ent. Soc., Trans. 20: 273. ♀, ♂.

*Andrena subcommoda* Cockerell, 1902. Canad. Ent. 34: 45. ♀.

*Andrena angusi* Viereck, 1907. Ent. News 18: 284. ♀.

Taxonomy: Robertson, 1902. Amer. Ent. Soc., Trans. 28: 190. ♀, ♂ (key). —Atwood, 1934.

Canad. Jour. Res. 10: 208, 210. ♀, ♂ (key). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech.

Bul. 141: 206-209, figs. 37-39, table 5 (redescription, synonymy). —LaBerge, 1967. Nebr.

Univ. State Mus., Bul. 7: 294 (subgeneric assignment, *angusi*). —LaBerge, 1969. Amer. Ent. Soc., Trans. 95: 5-12, figs. 1, 24-28 (redescription).

Biology: Rau, 1922. Acad. Sci. St. Louis, Trans. 24: 33-34 (nest). —Clements and Long, 1923.

Carnegie Inst. Wash., Pub. 326: 249 (ecology). —Brittain, 1933. Canada Dept. Agr., Bul.

162: 94, figs. (floral relationships). —LaBerge, 1969. Amer. Ent. Soc., Trans. 95: 11, table 1 (floral relationships).



**fracta** Casad and Cockerell. West. Tex. to south Calif.; Mexico (Distrito Federal, Puebla, Zacatecas). Pollen: Polylectic, visits flowers of *Acacia*, *Argemone*, *Baileya*, *Cryptantha intermedia*, *Descourainia sophia*, *Dithyrea*, *Encelia farinosa*, *Eschscholzia*, *Fallugia*, *Geraea canescens*, *Lepidium*, *Lesquerella*, *Medicago*, *Oenothera*, *Opuntia*, *Phacelia*, *Physaria*, *Prosopis*, *Prunus*, *Pyrus*, *Salix*, *Senecio*.

*Andrena fracta* Casad and Cockerell, 1896. Ann. and Mag. Nat. Hist. (6) 18: 84. ♂, ♀.

Taxonomy: LaBerge, 1969. Amer. Ent. Soc., Trans. 95: 30-34, figs. 14-18 (redescription).

Biology: LaBerge, 1969. Amer. Ent. Soc., Trans. 95: 34, table 3 (floral relationships).

**mellea** Cresson. Tex., N. Mex., Ariz. Pollen: Unknown, but visits flowers of *Argemone*, *Asclepias subverticillata*, *Baccharis glutinosa*, *Fallugia paradoxa*, *Melilotus alba*, *Salix*.  
*Andrena mellea* Cresson, 1868. Amer. Ent. Soc., Trans. 1: 384. ♀.

Taxonomy: Cockerell, 1898. Denison Univ. Sci. Labs., Bul. 11: 48 (key). —Cockerell, 1931.

Amer. Mus. Novitates 458: 16. ♀ (key). —LaBerge, 1969. Amer. Ent. Soc., Trans. 95: 16-18, figs. 19-23 (redescription).

**prunorum prunorum** Cockerell. Sask., west to B. C., south to west. Tex., N. Mex., Ariz. and Calif.; Mexico (Baja California). Pollen: Polylectic, visits a wide variety of flowers including *Acer*, *Actinea*, *Adenostoma*, *Amsinckia douglasiana*, *Arabis*, *Arctostaphylos*, *Argemone*, *Baccharis glutinosa*, *B. viminea*, *Barbarea orthoceras*, *Berberis*, *Brassica campestris*, *B. incana*, *B. nigra*, *Calochortus venustus*, *Calyptidium umbellatum*, *Ceanothus integriramus*, *Cercocarpus betuloides*, *Chaenactis glabriuscula*, *Chamaebatia foliolosa*, *Chrysothamnus*, *Clarkia biloba*, *C. rhomboidea*, *Clematis*, *Cleome serrulata*, *Crataegus*, *Crepis*, *Cryptantha intermedia*, *Cymopterus*, *Encelia farinosa*, *Eriastrum virgata*, *Erigeron*, *Eriodictyon trichocalyx lanatum*, *Eriogonum fasciculatum*, *E. nudum*, *Eriophyllum*, *Erysimum asperum*, *Eschscholzia californica*, *Fallugia paradoxa*, *Gilia capitata*, *G. davyi*, *Hackelia*, *Helianthus*, *Heracleum*, *Hyptis emoryi*, *Lappula*, *Larrea tridentata*, *Lepidium flavum*, *Lesquerella*, *Linaria*, *Lithospermum*, *Lomatium*, *Malus*, *Melilotus*, *Mentzelia*, *Micranthus*, *Monardella lanceolata*, *Nemophila*, *Opuntia*, *Pastinaca*, *Penstemon*, *Petalostemon*, *Phacelia distans*, *P. minor*, *Philadelphus lewisii californica*, *Platystemon*, *Plumbago*, *Potentilla*, *Prosopis*, *Prunus*, *Purshia*, *Ranunculus*, *Raphanus sativa*, *Rhamnus californicus*, *Rhus*, *Ribes*, *Rorippa*, *Rubus*, *Salix*, *Sambucus caerulea*, *Sanicula nevadensis*, *Sophia*, *Sphaeralcea ambigua*, *Shepherdia*, *Sisymbrium irio*, *S. linifolia*, *Solidago*, *Spiraea*, *Symphoricarpos*, *Syringa*, *Tamarix gallica*, *Taraxacum officinale*, *Thysanocarpus curvipes*, *Trichostema parishii*, *Trifolium*.

*Andrena prunorum* Cockerell, 1896. Ann. and Mag. Nat. Hist. (6) 18: 81. ♀, ♂.

*Andrena kincaidii* Cockerell, 1897. Acad. Nat. Sci. Phila., Proc. 49: 351. ♀.

*Andrena pascoensis* Cockerell, 1897. Entomologist 30: 305. ♀.

*Andrena prunorum gillettei* Cockerell, 1898. Ent. News 9: 172. ♂.

*Andrena vernoni* Viereck, 1904. Canad. Ent. 36: 190, 195. ♀, ♂.

*Andrena arizonensis* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 42. ♂.

*Andrena prunorum* var. *mariformis* Cockerell, 1916. Pomona Jour. Ent. Zool. 8: 46. ♀.

*Andrena (Andrena) shasta* Viereck, 1926. Calif. Acad. Sci., Proc. (4) 15: 402. ♀.

*Andrena prunorum* var. *pauperatula* Cockerell, 1938. Canad. Ent. 70: 6. ♀.

Taxonomy: Viereck, 1904. Canad. Ent. 36: 190, 195. ♀, ♂ (key, as *kincaidii*). —Cockerell, 1914. Ann. and Mag. Nat. Hist. (8) 14: 11. ♀ (key). —Cockerell, 1931. Amer. Mus. Novitates 458: 16. ♀, ♂ (key). —Lanham, 1941. Ent. Soc. Amer., Ann. 34: 704, 707. ♀, ♂ (key). —LaBerge, 1969. Amer. Ent. Soc., Trans. 95: 18-30, figs. 2-3, 9-13 (redescription, synonymy, integumental color variation).

Biology: LaBerge, 1969. Amer. Ent. Soc., Trans. 95: 28-30, table 2 (floral relationships).

**prunorum sinaloa** Viereck. Ariz.; Mexico (Baja California and Sinaloa). Pollen: Presumably polylectic, visits flowers of *Encelia farinosa*, *Larrea tridentata*.

*Andrena sinaloa* Viereck, 1926. Calif. Acad. Sci., Proc. (4) 15: 403. ♀.

Taxonomy: LaBerge, 1969. Amer. Ent. Soc., Trans. 95: 30 (redescription).

Genus *ANDRENA* Subgenus *PTILANDRENA* Robertson

*Ptilandrena* Robertson, 1902. Amer. Ent. Soc., Trans. 28: 192.

Type-species: *Andrena erigeniae* Robertson. Orig. desig.

- Taxonomy: Lanham, 1949. Calif. Univ. Pubs. Ent. 8: 215 (tax. characters). —LaBerge, 1964. Nebr. Univ. State Mus., Bul. 4: 283, 290, 307-308 (tax. characters). —Davis and LaBerge, 1975. Ill. Nat. Hist. Survey, Biol. Notes 95: 2 (included spp.).
- distans* Provancher. Canada; Minn. to New England, south to N. C. Pollen: Unknown, but visits flowers of *Geranium maculatum*, *Heracleum lanatum*, *Polemonium reptans*. *Andrena distans* Provancher, 1888. Addit. Corr. Faune Ent. Canada, Hym., p. 307. ♀, ♂.
- Andrena g. maculati* Robertson, 1897. Acad. Sci. St. Louis, Trans. 7: 333. ♀, ♂. Trinomial.
- Andrena gerani-maculati* Viereck, 1907. Ent. News 18: 282. ♀.
- Taxonomy: Viereck, 1907. Ent. News 18: 282, 286. ♀, ♂ (key). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 154-155, figs. 27, 29-30, table 4 (redescription, synonymy).
- erigeniae* Robertson. Ont. to Ga., west to Minn., Mo. and Okla. Parasite: *Leucophora obtusa* (Zett.), *Stylops erigeniae* Pierce. Pollen: Apparently collects pollen only from the flowers of *Claytonia virginica* with which it is largely coterminous, but visits these and other flowers for nectar including *Barbarea vulgaris*, *Collinsia verna*, *Dicentra laciniata*, *D. cucullaria*, *Erigenia bulbosa*, *Erythronium americanum*, *Hydrophyllum appendiculata*, *Isopyrum biternatum*, *Prunus*, *Veronica hederaefolia*.
- Andrena erigeniae* Robertson, 1891. Amer. Ent. Soc., Trans. 18: 52. ♀, ♂.
- Taxonomy: Robertson, 1902. Amer. Ent. Soc., Trans. 28: 192. ♀, ♂ (key). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 155-156, figs. 27, 29-31, table 4 (redescription). —Davis and LaBerge, 1975. Ill. Nat. Hist. Survey, Biol. Notes 95: 13, figs. 13, 16-24 (immature stages).
- Biology: Davis and LaBerge, 1975. Ill. Nat. Hist. Survey, Biol. Notes 95: 1-16, figs. 1-25, 1 table (nest, architecture, life history, provisioning, inquilinism, parasitism).
- polemonii* Robertson. Ill., Mich. Pollen: Unknown, but visits flowers of *Geranium maculatum*, *Polemonium reptans*, *Ranunculus septentrionalis*.
- Andrena polemonii* Robertson, 1891. Amer. Ent. Soc., Trans. 18: 54. ♀, ♂.
- Taxonomy: Robertson, 1902. Amer. Ent. Soc., Trans. 28: 190, 192. ♀, ♂ (key). —Robertson 1904. Canad. Ent. 36: 278. (tax. characters). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 157-158, figs. 27, 31, table 4 (redescription).

Genus *ANDRENA* Subgenus *RHAPHANDRENA* LaBerge

*Andrena* subg. *Rhaphandrena* LaBerge, 1971. Amer. Ent. Soc., Trans. 97: 507.

Type-species: *Andrena prima* Casad and Cockerell. Orig. desig.

- Revision: LaBerge, 1971. Amer. Ent. Soc., Trans. 97: 507-514, figs. 1, 3, 6, 59-68 (N. Amer. spp.).
- dapsilis* LaBerge. Tex., Okla. Pollen: Unknown, but visits flowers of *Descourainia pinnata brachycarpa*, *Lesquerella*.
- Andrena (Rhaphandrena) dapsilis* LaBerge, 1971. Amer. Ent. Soc., Trans. 97: 511, figs. 6, 64-68. ♀, ♂.
- prima* Casad. West. Tex. to south. Calif. and north. Utah. Pollen: Apparently an oligolege of the brassicaceous flowers, especially *Lesquerella* including *L. gordonii*, but visits other flowers presumably for nectar including *Alyssum*, *Brassica oleracea*, *Cryptantha* probably *jamesii*, *Dithyrea wislizenii*, *Geraea canescens*, *Prunus*.
- Andrena prima* Casad, 1896. Ann. and Mag. Nat. Hist. (6) 18: 78. ♀.
- Taxonomy: Cockerell, 1898. Denison Univ. Sci. Labs., Bul. 11: 48. ♀ (key). —Linsley and MacSwain, 1961. Pan-Pacific Ent. 37: 129 (subgeneric assignment).

Genus *ANDRENA* Subgenus *SCAPHANDRENA* Lanham

*Andrena* subg. *Scaphandrena* Lanham, 1949. Calif. Univ. Pubs. Ent. 8: 200.

Type-species: *Andrena montrosensis* Viereck and Cockerell. Orig. desig.

*Andrena* subg. *Elandrena* Lanham, 1949. Calif. Univ. Pubs. Ent. 8: 203.

Type-species: *Andrena amplificata* Cockerell. Orig. desig.

*Andrena* subg. *Truncandrena* Warncke, 1968. Est. Mus. Zool. Coimbra Univ., Mem. 307: 46.

Type-species: *Andrena truncatilabris* Morawitz. Orig. desig.

Revision: Ribble, 1974. Amer. Ent. Soc., Trans. 100: 101-189, 99 figs., 5 tables (N. Amer. spp.).

Taxonomy: LaBerge, 1964. Nebr. Univ. State Mus., Bul. 4: 296 (tax. characters). — Ribble, 1973. Ent. Soc. Amer., Ann. 66: 1281-1286 (tax. status of type species).

#### **albicula** Viereck. Calif.

*Andrena albicula* Viereck, 1917. Amer. Ent. Soc., Trans. 43: 366. ♀.

Taxonomy: Ribble, 1974. Amer. Ent. Soc., Trans. 100: 173-174 (tax. status).

**arabis** Robertson. N. Y. to N. C., west to Mich. and Ill. Pollen: Polylectic, often collected on early spring flowering plants of the family Cruciferae; visitation records include *Arabis laevigata*, *Barbarea vulgaris*, *Brassica*, *Bursera*, *Capsella bursa-pastoris*, *Cardamine bulbosa*, *Claytonia virginica*, *Dentaria diphylla*, *D. lanciniata*, *Erigenia bulbosa*, *Erythronium americanum*, *Prunus*, *Salix microphylla*, *Spiraea*, *Stellaria media*, *Taraxacum officinale*, *Tussilago farfara*. Hybridizes with *A. scurra* Viereck and *A. capricornis* Casad and Cockerell.

*Andrena arabis* Robertson, 1897. Acad. Sci. St. Louis, Trans. 7: 334. ♀.

*Andrena* (*Pterandrena*) *brassicae* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 142, figs. 24, 25, 28. ♂.

Taxonomy: Robertson, 1902. Amer. Ent. Soc., Trans. 28: 191. ♀ (key). — Viereck, 1907. Ent. News 18: 282. ♀ (key). — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 251-252, figs. 54-56, table 7 (redescription). — Ribble, 1973. Ent. Soc. Amer., Ann. 66: 1281-1286 (hybridization). — Ribble, 1974. Amer. Ent. Soc., Trans. 100: 115-118, figs. 1, 14-18 (redescription, synonymy).

Biology: Ribble, 1974. Amer. Ent. Soc., Trans. 100: 118, table 1 (floral relationships).

**bruneri** Viereck and Cockerell. Nebr., Wyo., Colo., Nev. Pollen: Unknown, but visits flowers of *Astragalus*, *Erysimum*.

*Andrena bruneri* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 15. ♀.

*Andrena laramiensis* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 22, 23. ♂.

*Andrena viridibasis* Cockerell, 1930. N. Y. Ent. Soc., Jour. 37: 444. ♀.

Taxonomy: Cockerell, 1931. Amer. Mus. Novitates 458: 9. — Timberlake, 1951. In Linsley, In Muesebeck, Krombein and Townes, U. S. Dept. Agr., Agr. Monog. 2: 1059 (synonymy). — Ribble, 1974. Amer. Ent. Soc., Trans. 100: 161-164, figs. 1, 80-84 (redescription, synonymy).

**capricornis** Casad and Cockerell. Tex. to south. Calif. Parasite: *Stylops* sp. Pollen: Apparently polylectic, often collected at the flowers of the family Cruciferae; visitation records include *Actinea*, *Alyssum maritimum*, *Brassica oleracea*, *Descourainia sophia*, *Lesquerella gordonii*, *Physaria*, *Prunus*, *Salvia*. Hybridizes with *A. scurra* Viereck and *A. arabis* Robertson.

*Andrena capricornis* Casad and Cockerell, 1896. Canad. Ent. 28: 182. ♂.

Taxonomy: Cockerell, 1898. Denison Univ. Sci. Labs., Bul. 11: 48. ♂ (key). — Cockerell, 1899. Ent. News 10: 255. ♂ (key). — Ribble, 1973. Ent. Soc. Amer., Ann. 66: 1281-1286 (hybridization). — Ribble, 1974. Amer. Ent. Soc., Trans. 100: 120-122, figs. 1, 19-23 (redescription).

**chapmanae** Viereck. Calif., Oreg., Idaho, Nev. and Utah. Pollen: Unknown, but visits flowers of *Ceanothus*, *Chamaebatia foliolosa*, *Clarkia dudleyana*, *Cryptantha ambigua*, *C. flaccida*, *C. intermedia*, *C. micrantha* var. *lepida*, *Descourainia sophia*, *Gilia capitata*, *G. latiflora* var. *cana*, *Hackelia patens*, *Lupinus*, *Mentzelia*, *Nemophila maculata*, *Phacelia linearis*, *Plagiobothrys canescens*, *P. nothofulvus*, *Prunus andersonii*, *Salix*, *Senecio canus*.

*Andrena* (*Andrena*) *chapmanae* Viereck, 1904. Canad. Ent. 36: 191. ♀.

*Andrena yosemitensis* Cockerell, 1924. Pan-Pacific Ent. 1: 61. ♀.

Taxonomy: Ribble, 1974. Amer. Ent. Soc., Trans. 100: 166-170, figs. 1, 8, 90-94 (redescription).

Biology: Ribble, 1974. Amer. Ent. Soc., Trans. 100: 168, table 5 (floral relationships).

**cruciferarum** Ribble. Calif. Pollen: Unknown, but visits flowers of *Amsinckia*, *Brassica*, *Capsella bursa-pastoris*, *Phacelia*, *Sisymbrium irio*.

*Andrena* (*Scaphandrena*) *cruciferarum* Ribble, 1974. Amer. Ent. Soc., Trans. 100: 128, figs. 1-2, 29-33. ♀, ♂.

**gordonii** Ribble. Northeast. Calif., Oreg., Wash., Wyo.

*Andrena* (*Scaphandrena*) *gordonii* Ribble, 1974. Amer. Ent. Soc., Trans. 100: 134, figs. 1-2, 39-43. ♀, ♂.

**hicksi** Cockerell. Colo., Wyo., Utah and Nev. (Ruby Mts.). Parasite: *Stylops* sp.

*Andrena hicksi* Cockerell, 1925. Ann. and Mag. Nat. Hist. (9) 16: 628. ♀.

*Andrena unicola* Cockerell, 1934. Pan-Pacific Ent. 9: 155. ♂.

Taxonomy: Linsley, 1938. Calif. Acad. Sci., Proc. (4) 23: 265. ♀ (key). —Lanham, 1941. Ent. Soc. Amer., Ann. 34: 705, 707. ♀, ♂ (key). —Lanham, 1941. Ent. Soc., Amer., Ann. 34: 707. ♂ (key, as *unicula*). —Ribble, 1974. Amer. Ent. Soc., Trans. 100: 164-166, figs. 1, 6, 85-89 (redescription, synonymy).

Biology: Ribble, 1974. Amer. Ent. Soc., Trans. 100: 165 (stylopization).

**kaibabensis** Ribble. Ariz., Utah.

*Andrena* (*Scaphandrena*) *kaibabensis* Ribble, 1974. Amer. Ent. Soc., Trans. 100: 160, figs. 1, 8. ♀.

**lomatii** Ribble. Calif. Pollen: Unknown, but visits flowers of *Lomatium dasycarpum*, *Rhus trilobata*, *Salvia sonomensis*, *Sanicula nevadensis*.

*Andrena* (*Scaphandrena*) *lomatii* Ribble, 1974. Amer. Ent. Soc., Trans. 100: 131, figs. 1, 5, 34-38. ♀, ♂.

**mackieae** Cockerell. South. Oreg., Calif., Nev., Utah, Ariz.; Mexico (Baja California). Pollen:

Unknown, but visits flowers of *Amsinckia*, *Arctostaphylos*, *Brassica*, *Ceanothus cordulatus*, *C. crassifolius*, *C. cuneatus*, *C. integerrimus*, *C. verrucosus*, *Cryptantha*, *Phacelia distans*, *Plagiobothrys*, *Prunus virginiana*, *Rhamnus crocea*, *Rhus diversiloba*, *Salix lasiolepis*.

*Andrena mackieae* Cockerell, 1937. Amer. Mus. Novitates 899: 3. ♀.

*Andrena* (!*Scaphandrena*) *mackieae* (!) Lanham, 1949. Calif. Univ. Pubs. Ent. 8: 201.

Taxonomy: Ribble, 1974. Amer. Ent. Soc., Trans. 100: 144-149, figs. 1, 6, 59-63 (redescription).

Biology: Ribble, 1974. Amer. Ent. Soc., Trans. 100: 147, table 3 (floral relationships).

**merriami** Cockerell. B. C. to Calif., east to Mont., Nebr. Colo. and N. Mex. Pollen: Unknown, but visits flowers of *Acer*, *Astragalus*, *Cardaria draba*, *Claytonia*, *Daucus carota*, *Fraxinus*, *Gilia capitata*, *Hackelia patens*, *Lappula floribunda*, *Leptotaenia*, *Lithophragma affinis*, *Lomatium ambiguum* var. *leptocarpum*, *L. dissectum*, *L. orientale*, *L. triternatum*, *Phacelia*, *Prunus demissa*, *P. virginiana*, var. *melanocarpa*, *P. subcordata*, *Pyrus*, *Ranunculus*, *Salix*, *Taraxacum officinale*, *Thelypodium*.

*Andrena merriami* Cockerell, 1901. Psyche 9: 284. ♀.

*Andrena pullmani* Viereck, 1904. Canad. Ent. 36: 191, 195. ♀, ♂.

*Andrena amplificata* Cockerell, 1910. Canad. Ent. 42: 368. ♀, ♂.

*Andrena fulvinigra* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 42. ♀.

Taxonomy: Ribble, 1974. Amer. Ent. Soc., Trans. 100: 150-155, figs. 1, 3, 64-69 (redescription, synonymy).

Biology: Ribble, 1974. Amer. Ent. Soc., Trans. 100: 153, table 4 (floral relationships).

**mohavensis** Ribble. South. Calif. (Mohave Desert). Pollen: Unknown, but visits flowers of *Lepidium flavum*, *Phacelia*, *Salix exigua*.

*Andrena* (*Scaphandrena*) *mohavensis* Ribble, 1974. Amer. Ent. Soc., Trans. 100: 126, figs. 1, 2, 24-28. ♀, ♂.

**plana** Viereck. Oreg., Calif. Pollen: Apparently oligolectic on *Trifolium* including *T.*

*involutarum*, *T. microcephalum*, *T. pratense*, *T. repens*, *T. tridentatum*, *T. variegatum*, but visits other flowers presumably for nectar including *Brassica*, *Chamaebatia*

*foliolosa*, *Cryptantha*, *Gilia*, *Lasthenia chrysostoma*, *Layia platyglossa* var. *brevisetata*, *Linanthus douglasii*, *Nemophila*, *Orthocarpus faucibarbatatus*, *Plagiobothrys nothofulvus*, *Ranunculus*, *Rhus trilobata*, *Sisyrinchium bellum*, *Vicia*.

*Andrena plana* Viereck, 1904. *Canad. Ent.* 36: 193. ♀.

**Taxonomy:** Ribble, 1974. *Amer. Ent. Soc., Trans.* 100: 141-144, figs. 1, 7, 54-58 (redescription).  
**primulifrons** Casad. Tex. to Ariz. and south. Nev. (Hoover Dam). Pollen: Possibly an oligolege of *Lesquerella* including *L. densiflora*, *L. gordonii*, *L. ludoviciana*, but visits other flowers including *Descourainia pinnata*, *Dithyrea wislizenii*, *Larrea tridentata*, *Lobularia*, *Machaeranthera tanacetifolia*, *Oreocarya*, *Phacelia crenulata*, *Physaria*, *Prunus*, *Sisymbrium*.

*Andrena primulifrons* Casad, 1896. *Canad. Ent.* 28: 183. ♂, ♀.

**Taxonomy:** Cockerell, 1898. Denison Univ. Sci. Labs., *Bul.* 11: 48, 49. ♂, ♀ (key). — Ribble, 1968. *Nebr. Univ. State Mus., Bul.* 8: 328-332, figs. 85-87, map 10, table 11 (redescription). — Ribble, 1974. *Amer. Ent. Soc., Trans.* 100: 104, fig. 1 (subgeneric position).

**santaclarae** Ribble. Calif. Pollen: Unknown, but males visit flowers of *Cryptantha*, *Lasthenia*, *Nemophila*, *Prunus subcordata*.

*Andrena* (*Scaphandrena*) *santaclarae* Ribble, 1974. *Amer. Ent. Soc., Trans.* 100: 136, figs. 1, 4, 44-48. ♀, ♂.

**scurra** Viereck. B. C. to Calif., east to Idaho and north. Utah. Pollen: Unknown, but visits flowers of *Achillea lanulosa*, *Baccharis*, *Brassica campestris*, *Capsella bursa-pastoris*, *Cardaria draba*, *Ceanothus greggii*, *C. palmeri*, *Cosmos*, *Cotoneaster*, *Descourainia sophia*, *Lepidium*, *Lomatium dissectum*, *L. triternatum*, *Medicago sativa*, *Prunus subcordata*, *Salix*, *Scrophularia californica*, *Sisymbrium altissimum*, *Spiraea*, *Taraxacum*, *Thlaspi arvense*. Hybridizes with *A. arabis* Robertson and *A. capricornis* Casad and Cockerell in the Great Basin area of the western United States and in the Rocky Mountain area.

*Andrena scurra* Viereck, 1904. *Canad. Ent.* 36: 193, 195. ♀, ♂.

**Taxonomy:** Ribble, 1973. *Ent. Soc. Amer., Ann.* 66: 1281-1286 (hybridization). — Ribble, 1974. *Amer. Ent. Soc., Trans.* 100: 110-115, figs. 1, 9-13 (redescription).

**scurra x arabis x capricornis** Hybrids. Idaho, Wyo., Colo., Utah, Nev. and along the east slope of the Rocky Mountains from north. N. Mex. to south. Alta; Calif. (Seven Oaks) and Ariz. (Fredonia). Pollen: Apparently polylectic, exhibits a preference for the flowers of the family Cruciferae, but visits a variety of flowers including *Agoseris*, *Astragalus*, *Brassica*, *Cardaria draba*, *Cleome serrulata*, *Euphorbia*, *Lappula floribunda*, *Lepidium virginicum* var. *medium*, *Lesquerella ovalifolia*, *Oxytropis*, *Philadelphus*, *Physaria didymocarpa*, *Prunus*, *Ribes*, *Senecio canus*, *Sisymbrium altissimum*, *S. pinnatum*, *Taraxacum officinale*.

*Andrena sieverti* Cockerell, 1906. *Amer. Mus. Nat. Hist., Bul.* 22: 436. ♀.

*Andrena lappulae* Cockerell, 1906. *Amer. Mus. Nat. Hist., Bul.* 22: 437. ♂.

*Andrena ellisiae* Cockerell, 1914. *Ann. and Mag. Nat. Hist.* (8) 14: 9. ♀.

*Andrena montrosensis* Viereck and Cockerell, 1914. *U. S. Natl. Mus., Proc.* 48: 48. ♀.

*Andrena speculifera* Cockerell, 1930 (1929). *N. Y. Ent. Soc., Jour.* 37: 444. ♀.

*Andrena physariae* Cockerell, 1934. *Pan-Pacific Ent.* 9: 154. ♀.

*Andrena sieverti* var. *opacicauda* Cockerell, 1936. *Amer. Mus. Novitates* 831: 1. ♀.

**Taxonomy:** Cockerell, 1931. *Amer. Mus. Novitates* 458: 13. ♀ (key, as *sieverti*). — Lanham, 1941. *Ent. Soc. Amer., Ann.* 34: 706. ♀ (key, as *ellisiae*). — Lanham, 1941. *Ent. Soc. Amer., Ann.* 34: 706. ♀ (key, as *physariae*). — Ribble, 1973. *Ent. Soc. Amer., Ann.* 66: 1281-1286 (hybridization). — Ribble, 1974. *Amer. Ent. Soc., Trans.* 100: 122-126 (synonymy).

**Biology:** Ribble, 1974. *Amer. Ent. Soc., Trans.* 100: 124, table 2 (floral relationships, stylopization).

**shoshoni** Ribble. Wyo. (Big Horn and Foxpark).

*Andrena* (*Scaphandrena*) *shoshoni* Ribble, 1974. *Amer. Ent. Soc., Trans.* 100: 172, figs. 1, 8. ♀.

**sladeni** Viereck. B. C. to Wyo. and Nev. Pollen: Unknown, but visits flowers of *Taraxacum officinale*.

*Andrena (Andrena) sladeni* Viereck, 1924. Canad. Ent. 56: 239. ♀.

Taxonomy: Cockerell, 1932. Canad. Ent. 64: 286 (key). — Ribble, 1974. Amer. Ent. Soc., Trans. 100: 155-158, figs. 1, 4, 70-74 (redescription).

**tildeni** Ribble. Calif., Ariz. Pollen: Unknown, but visits flowers of *Cryptantha intermedia*, *Salix argophylla*, *S. exigua*.

*Andrena (Scaphandrena) tildeni* Ribble, 1974. Amer. Ent. Soc., Trans. 100: 139, figs. 1, 3, 49-53. ♂.

**trapezoidea** Viereck. Tex., Okla. Pollen: Unknown, but visits flowers of *Descourainia pinnata*, *Lesquerella densiflora*, *L. gordonii*, *L. gracilis*, *L. recurvata*, *Rhus microphylla*.

*Andrena (Scrapter) trapezoidea* Viereck, 1917. Amer. Ent. Soc., Trans. 43: 402. ♀.

Taxonomy: Ribble, 1968. Nebr. Univ. State Mus., Bul. 8: 328-332, figs. 85-87, map 10, table 11 (redescription). — Ribble, 1974. Amer. Ent. Soc., Trans. 100: 104, fig. 1 (subgeneric position).

**vestali** Cockerell. Colo., Nebr. Pollen: Unknown, but visits flowers of *Viola*.

*Andrena vestali* Cockerell, 1913. Ann. and Mag. Nat. Hist. (8) 11: 64. ♂.

*Andrena vestali* var. *dolichocera* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 19. ♂.

Taxonomy: Lanham, 1941. Ent. Soc. Amer., Ann. 34: 707. ♂ (key). — Ribble, 1974. Amer. Ent. Soc., Trans. 100: 170-172, figs. 1, 8, 95-99 (redescription).

**walleyi** Cockerell. B. C. to Calif. (Alpine Co.), east to Idaho and Utah. Pollen: Unknown, but visits flowers of *Cardaria draba*.

*Andrena walleyi* Cockerell, 1932. Canad. Ent. 64: 286. ♀.

Taxonomy: Ribble, 1974. Amer. Ent. Soc., Trans. 100: 158, figs. 1, 5, 75-79 (redescription).

#### Genus ANDRENA Subgenus SCOLIANDRENA Lanham

*Andrena* subg. *Scoliandrena* Lanham, 1949. Calif. Univ. Pubs. Ent. 8: 223.

Type-species: *Andrena osmioides* Cockerell. Monotypic and orig. desig.

The species of this subgenus chiefly visit the flowers of *Cryptantha* upon which the females are apparently solely dependent for pollen.

Taxonomy: LaBerge, 1964. Nebr. Univ. State Mus., Bul. 4: 283, 291, 313 (tax. characters).

**cryptanthae** Timberlake. South. Calif. Pollen: Oligolege of *Cryptantha* including *C. barbigera*, *C. intermedia*, but visits other flowers for nectar.

*Andrena (Scoliandrena) cryptanthae* Timberlake, 1951. U. S. Natl. Mus. Proc. 101: 401. ♀, ♂.

**osmioides benitonis** Lanham. North. Calif. Pollen: Oligolege of *Cryptantha*.

*Andrena osmioides benitonis* Lanham, 1949. Pan-Pacific Ent. 25: 148. ♀, ♂.

**osmioides osmioides** Cockerell. South. Calif. Pollen: Oligolege of *Cryptantha* including *C. intermedia*, but visits other flowers for nectar including *Plagiobothrys californica*, *P. nothofulvus*.

*Andrena osmioides* Cockerell, 1916. Pomona Jour. Ent. Zool. 8: 45. ♂.

#### Genus ANDRENA Subgenus SCRAPTEROPSIS Viereck

*Andrena* subg. *Scrapteropsis* Viereck, 1922. Boston Soc. Nat. Hist., Occas. Papers 5: 42.

Type-species: *Andrena (Scrapteropsis) fenningeri* Viereck. Monotypic.

*Andrena* subg. *Mimandrena* Lanham, 1949. Calif. Univ. Pubs. Ent. 8: 217.

Type-species: *Andrena imitatrix* Cresson. Orig. desig.

Revision: LaBerge, 1971. Amer. Ent. Soc., Trans. 97: 441-504, figs. 1-53, 1 table (N. Amer. spp.).

Taxonomy: Warneke, 1968. Coimbra Univ. Est. Mus. Zool., Mem. 307: 68-69 (synonymy).

—LaBerge, 1973. Amer. Ent. Soc., Trans. 99: 235, 237-240 (phylogeny, tax. status).

- alamonis** Viereck. West. Tex., N. Mex., Ariz. Pollen: Unknown, but visits flowers of *Lesquerella*.  
*Andrena* (*Scapter*) *alamonis* Viereck, 1917. Acad. Nat. Sci. Phila., Proc. 68: 599. ♀.
- alleghaniensis** Viereck. Ont. and Maine to S. C. west to Sask. and Colo. Pollen: Apparently polylectic, visits flowers of *Amelanchier*, *Barbarea*, *Brassica*, *Chrysanthemum leucanthemum*, *Cornus*, *Crataegus*, *Euphorbia cyparissias*, *Fragaria vesca*, *F. virginiana*, *Ledum*, *Melilotus alba*, *Prunus*, *Ranunculus*, *Rubus idaeus*, *Salix*, *Viburnum opulus*.  
*Andrena* (*Trachandrena*) *alleghaniensis* Viereck, 1907. Ent. News 18: 280, 286. ♀.
- Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 177 (redescription). — Knerer and Atwood, 1963. Canad. Ent. 95: 583, figs. 1, 3. ♂. — Knerer and Atwood, 1964. Ent. Soc. Ontario, Proc. 94: 47-48. — LaBerge, 1971. Ent. Soc. Amer., Trans. 97: 474-479, figs. 1, 5, 27-31 (redescription).
- angusticus** LaBerge. Calif. Pollen: Unknown, but visits flowers of *Lasthenia chrysostoma*, *Platystemon californicus*.  
*Andrena* (*Scapteropsis*) *angusticus* LaBerge, 1971. Amer. Ent. Soc., Trans. 97: 499, figs. 1, 6. ♀.
- aquila** LaBerge Calif. (Fresno County). Pollen: Unknown, but visits flowers of *Platystemon californicus*.  
*Andrena* (*Scapteropsis*) *aquila* LaBerge, 1971. Amer. Ent. Soc., Trans. 97: 502, figs. 1, 6. ♀.
- atlantica** Mitchell. N. J. to Fla., west to Miss. Pollen: Apparently polylectic, visits flowers of *Crataegus*, *Diospyros virginiana*, *Fragaria*, *Ilex glabra*, *Ligustrum*, *Linaria*, *Lyssa sylvatica*, *Polycodium*, *Pyracantha*, *Rubus*, *Salix nigra*, *Senecio*, *Spiraea*, *Toxicodendron*.  
*Andrena* (*Trachandrena*) *atlantica* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 178, figs. 35-37. ♀, ♂.
- Taxonomy: LaBerge, 1971. Amer. Ent. Soc., Trans. 97: 479-481, figs. 1, 5 (redescription).
- biareola** LaBerge. Calif. Pollen: Unknown, but visits flowers of *Cryptantha*, *Meconella*, *Platystemon californicus*.  
*Andrena* (*Scapteropsis*) *biareola* LaBerge, 1971. Amer. Ent. Soc., Trans. 97: 494, figs. 1, 3. ♀, ♂.
- buccata** LaBerge. Calif. Pollen: Unknown, but visits flowers of *Blennosperma nana*, *Lasthenia*, *Platystemon*.  
*Andrena* (*Scapteropsis*) *buccata* LaBerge, 1971. Amer. Ent. Soc., Trans. 97: 497, figs. 1, 6, 49-53. ♀, ♂.
- daeckei** Viereck. N. J., Pa.  
*Andrena* (*Trachandrena*) *daeckei* Viereck, 1907. Ent. News 18: 280, 285, 286. ♀, ♂.
- Taxonomy: LaBerge, 1971. Amer. Ent. Soc., Trans. 97: 486-489, figs. 1, 4, 37-41 (redescription, distribution).
- fenningeri** Viereck. Mass. to Ga., west to Ill., Tenn. and Tex. Pollen: Polylectic, with a strong preference for *Salix* including *S. humilis*, *S. sericea*, *S. tristis* and a secondary preference for *Prunus* including *P. americanus*, *P. persica*, but visits other flowers including *Acer rubrum*, *Alsine media*, *Amelanchier*, *Aronia*, *Pyrus malus*.  
*Andrena* (*Scapteropsis*) *fenningeri* Viereck, 1922. Boston Soc. Nat. Hist., Occas. Papers 5: 42, figs. ♀, ♂.
- Andrena* (*Trachandrena*) *indianensis* Cockerell, 1929. Ent. Soc. Amer., Ann. 22: 757. ♀.  
*Andrena* (?*Mimandrena*) *verna* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 206, figs. 37, 38. ♂.
- Taxonomy: LaBerge, 1971. Amer. Ent. Soc., Trans. 97: 465-470, figs. 1, 6, 17-21 (redescription, synonymy).
- flaminea** LaBerge. Tex. (Beeville and Edinburg).  
*Andrena* (*Scapteropsis*) *flaminea* LaBerge, 1971. Amer. Ent. Soc., Trans. 97: 472, fig. 1. ♀.

*ilicis* Mitchell. N. Y. to north. Fla., west to Kans. and Tex. Pollen: Unknown, but visits flowers of *Batodendron*, *Castanea pumila*, *Celastrus*, *Crataegus*, *Diospyros virginiana*, *Ilex*, *Prunus*, *Rhus glabra*, *Salix*.  
*Andrena (Trachandrena) ilicis* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 186, fig. 35. ♀.

Taxonomy: LaBerge, 1971. Amer. Ent. Soc., Trans. 97: 459-463, figs. 1, 3, 12-16 (redescription).

*imitatrix* Cresson. Que. to Fla. west to Alta., Mont., Utah and Ariz. Pollen: Polylectic, although exhibits a strong preference for the flowers of the Rosaceae and Salicaceae; visitation records include *Acer negundo*, *Alsine media*, *Amelanchier arborea*, *A. canadensis*, *Amorpha fruticosa*, *Angelica atropurpurea*, *Antennaria dioicum*, *Astragalus*, *Barbarea vulgaris*, *Benzoïn aestivale*, *Cassia fasciculata*, *Ceanothus ovatus*, *Claytonia*, *Cornus*, *Crataegus mollis*, *C. occidentalis*, *Dentaria laciniata*, *Descourainia intermedia*, *Diospyros virginiana*, *Erythronium*, *Euphorbia*, *Exochorda racemosa*, *Forsythia*, *Grossularia*, *Heracleum*, *Ilex*, *Laurocerasus caroliniana*, *Lepargyrea canadensis*, *Lomatium daucifolium*, *L. foeniculaceum*, *Lonicera morrowi*, *Medicago sativa*, *Pastinaca sativa*, *Paeonia*, *Phacelia*, *Physocarpus opulifolius*, *Populus*, *Prunus americana*, *P. gracile*, *P. pennsylvanica*, *P. serotina*, *P. virginiana*, *Ptelea*, *Pyracantha*, *Pyrus malus*, *Rhamnus utilis*, *Rhus aromatica*, *R. canadensis*, *Ribes gracile*, *Rosa*, *Rubus*, *Salix amygdaloides*, *S. babylonica*, *S. bebbiana*, *S. discolor*, *S. longifolia*, *S. nigra*, *Senecio*, *Spiraea aruncus*, *S. thunbergi*, *S. vanhouttei*, *Tamarix gallica*, *Taraxacum officinale*, *Thlaspi arvense*, *Vaccinium*, *Viburnum dentatum*, *V. prunifolium*, *Zygadenia*, *Zizia*.

*Andrena imitatrix* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 258. ♀.

*Andrena claytoniae* Robertson, 1891. Amer. Ent. Soc., Trans. 18: 59. ♀, ♂.

*Trachandrena albofoveata* Graenicher, 1903. Canad. Ent. 35: 166. ♀.

*Andrena johnsoniana* Cockerell, 1906. Ann. and Mag. Nat. Hist. (7) 17: 224. ♀.

*Andrena (Trachandrena) crataegiphila* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 7. ♂.

*Andrena (Trachandrena) titusi* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 12. ♀.

*Andrena (Scapter) imitatrix* var. *profunda* Viereck, 1917. Amer. Ent. Soc., Trans. 43: 398. ♀.

*Andrena (Trachandrena) tardula* Cockerell, 1930. N. Y. Ent. Soc., Jour. 37: 447. ♀.

Taxonomy: Robertson, 1902. Amer. Ent. Soc., Trans. 28: 190. ♀, ♂ (key). — Cockerell, 1929. Ent. Soc. Amer., Ann. 22: 755 (tax. characters). — Cockerell, 1931. Canad. Ent. 63: 22. ♀ (as *johnsoniana*). — Cockerell, 1931. Amer. Mus. Novitates 458: 11. ♀ (as *johnsoniana*). — Lanham and Timberlake, 1951. In Muesebeck, Krombein and Townes, U. S. Dept. Agr., Agr. Monog. 2: 1068 (synonymy). — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 205-206, fig. 37-39, table 5 (redescription, synonymy). — Yager and Rozen, 1966. Amer. Mus. Novitates 2265: 6 (pupa). — LaBerge, 1971. Amer. Ent. Soc., Trans. 97: 451-459, figs. 1-2, 7-11 (redescription, synonymy).

Biology: Rau, 1922. Acad. Sci. St. Louis, Trans. 24: 34 (nesting habits). — Clements and Long, 1923. Carnegie Inst. Wash., Pub. 336: 249 (ecology). — LaBerge, 1971. Amer. Ent. Soc., Trans. 97: 457-459, table 1 (floral relationships).

*kalmiae* Atwood. N. S., Que. and Ont. south to Mass. and Conn. Pollen: Apparently an oligolege of *Kalmia* including *K. angustifolia*, but visits other flowers presumably for nectar including *Ledum*, *Lyonia ligustrina*, *Vaccinium*.

*Andrena kalmiae* Atwood, 1934. Canad. Jour. Res. 10: 210, fig. ♀, ♂.

Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 186, fig. 35, table 5 (redescription). — LaBerge, 1971. Amer. Ent. Soc., Trans. 97: 489-491, figs. 1, 4 (redescription, distribution).

*morrisonella* Viereck. Ont. to Fla., west to Ill. and Ala. Pollen: Unknown, but visits flowers of *Amelanchier*, *Crataegus*, *Gypsophila*, *Ilex*, *Malus*, *Populus*, *Prunus*, *Ranunculus acris*, *Rubus*, *Salix*.

*Andrena (Scapter) morrisonella* Viereck, 1917. Amer. Ent. Soc., Trans. 43: 399. ♀.



- Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 192, fig. 35, table 5 (redescription). — LaBerge, 1971. Amer. Ent. Soc., Trans. 97: 463-465, fig. 1 (redescription).
- phenax** Cockerell. South. Calif.  
*Andrena phenax* Cockerell, 1898. Amer. Ent. Soc. Trans. 25: 188. ♀.
- Taxonomy: Linsley and MacSwain, 1961. Pan-Pacific Ent. 37: 129 (tax. status). — Thorp, 1969. Calif. Univ. Pubs. Ent. 52: 121-123 (tax. status). — LaBerge, 1971. Amer. Ent. Soc., Trans. 97: 503-504, fig. 1 (redescription).
- rubi** Mitchell. N. C. to Ga., west to Tex., Okla., Kans. and Nebr. Pollen: Unknown, but visits flowers of *Aronia*, *Crataegus*, *Descourainia intermedia*, *D. pinnata*, *Prunus americana*, *P. gracilis*, *Rubus*, *Salix nigra*, *Spiraea*.  
*Andrena (Trachandrena) rubi* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 198, fig. 35. ♀.
- stipator** LaBerge. Calif. Pollen: Unknown, but visits flowers of *Cryptantha*, *Meconella*, *Platystemon californicus*.  
*Andrena (Scrapteropsis) stipator* LaBerge, 1971. Amer. Ent. Soc., Trans. 97: 491, figs. 1, 3, 44-48. ♀, ♂.
- unicostata** LaBerge. Tex., Okla. Pollen: Unknown, but visits flowers of *Salix*.  
*Andrena (Scrapteropsis) unicostata* LaBerge, 1971. Amer. Ent. Soc., Trans. 97: 481, figs. 1, 5, 32-36. ♀, ♂.

#### Genus ANDRENA Subgenus SIMANDRENA Perez

- Simandrena* Perez, 1890. Soc. Linn. Bordeaux, Actes. 44: 174.  
 Type-species: *Andrena propinqua* Schenck. Desig. by Hedicke, 1933.
- Andrena* subg. *Platandrena* Viereck, 1924. Canad. Ent. 56: 21.  
 Type-species: *Andrena vestita* Provancher. Monotypic and orig. desig. (= *Andrena nasonii* Robertson)
- Andrena* subg. *Stenandrena* Timberlake, 1949. In Lanham, Calif. Univ. Pubs. Ent. 8: 213.  
 Type-species: *Andrena pallidifovea* (Viereck). Orig. desig.
- Taxonomy: LaBerge, 1964. Nebr. Univ. State Mus., Bul. 4: 285, 286, 293, 304 (tax. characters, synonymy).
- angustitarsata** Viereck. Wash. to Calif. Pollen: Apparently polylectic, visits a wide variety of flowers including *Achillea lanulosa*, *A. millefolium*, *Arenaria douglasii*, *Ceanothus cuneatus*, *C. greggii*, *C. integerrimus*, *C. leucodermis*, *C. orcuttii*, *C. palmeri*, *C. soredatus*, *Chamaebatia foliolosa*, *Claytonia spatulata*, *Eriodictyon californicum*, *Eriophyllum confertiflorum*, *Gilia capitata*, *Grossularia californica*, *Horkelia bolanderi*, *Lasthenia chrysostoma*, *Linanthus aureus*, *Lomatium utriculatum*, *Paeonia californica*, *Plagiobothrys nothofolius*, *Potentilla glandulosa*, *Prunus ilicifolia*, *Ranunculus californicus*, *Rhamnus californicus*, *R. crocea*, *Rhus diversiloba*, *Salix laevigata*, *S. lasiandra*, *S. lasiolepis*, *Sanicula bipinnatifida*, *S. nevadensis*, *S. tuberosa*, *Saxifraga integrifolia*, *Swertia parryi*, *Thysanocarpus curvipes*.  
*Andrena angustitarsata* Viereck, 1904. Canad. Ent. 36: 189, 196. ♀.  
*Pterandrena nudiscopa* Viereck, 1904. Canad. Ent. 36: 227, 228. ♀.
- essigi** Timberlake. South. Calif. Pollen: Unknown, but visits flowers of *Cryptantha intermedia*, *Lasthenia aristata*, *L. gracilis*, *Layia elegans*, *Rhamnus crocea*, *Rhus trilobata*, *Sisymbrium irio*.  
*Andrena (Stenandrena) essigi* Timberlake, 1951. U. S. Natl. Mus., Proc. 101: 384. ♀, ♂.
- friesei** Viereck. Calif. Ecology: Unknown, but visits flowers of *Amsinckia douglasiana*, *Brassica*, *Calandrinia menziesii*, *Eschscholzia californica*, *Lasthenia*, *Raphanus sativus*.  
*Andrena (Andrena) friesei* Viereck, 1917. Acad. Nat. Sci. Phila., Proc. 68: 558. ♀.
- huardi** Viereck. Calif. Pollen: Possibly an oligolege of *Salix* including *S. argophylla*, *S. gooddingii*, *S. hindsiana*, *S. laevigata*, *S. lasiolepis*, *S. nigra*, but visits other flowers possibly for nectar only including *Alyssum maritimum*, *Sambucus*.  
*Andrena (Andrena) angustitarsata huardi* Viereck, 1917. Amer. Ent. Soc., Trans. 43: 368. ♀.

**hypoleuca** Cockerell. South. Calif. (Catalina Island).

*Andrena hypoleuca* Cockerell, 1939. Pomona Jour. Ent. Zool. 31: 25. ♀.

**nasonii** Robertson. Eastern Canada and Minn., south to Ga. and Tex., Colo. Pollen: Apparently polylectic, visits a wide variety of flowers including *Acer*, *Amelanchier*, *Apocynum*, *Arabis*, *Capsella*, *Chaerophyllum*, *Claytonia*, *Crataegus*, *Forsythia*, *Fragaria*, *Ilex*, *Ligustrum*, *Polemonium*, *Polytaenia*, *Potentilla*, *Prunus*, *Pyracantha*, *Ranunculus*, *Rhamnus*, *Rubus*, *Senecio*, *Sisymbrium*, *Spiraea*, *Taenidia*, *Toxicodendron*, *Viburnum*, *Viola*, *Zizia*.

*Andrena vestita* Provancher, 1888. Addit. Corr. Faune Ent. Canada, Hym., p. 310. ♂. Preoce.

*Andrena nasonii* Robertson, 1895. Amer. Ent. Soc., Trans. 22: 120. ♀.

*Andrena hartfordensis* Cockerell, 1902. Ann. and Mag. Nat. Hist. (7) 9: 103. ♀.

*Andrena (Andrena) nasonii* var. *fulvodorata* Viereck, 1917. Amer. Ent. Soc., Trans. 43: 385. ♀.

Taxonomy: Robertson, 1902. Amer. Ent. Soc., Trans. 28: 190, 192. ♀, ♂ (key). — Viereck, 1907. Ent. News 18: 283, 285. ♀, ♂ (key). — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 244-245, figs. 51-52, 54 (redescription).

**opacella** Timberlake. Calif. (Mt. Hamilton Range). Pollen: Unknown, but visits flowers of *Salix*.

*Andrena (Simandrena) opacella* Timberlake, 1951. U. S. Natl. Mus., Proc. 101: 406. ♀.

**opacibasis** Cockerell. Calif.

*Andrena (Platandrena) opacibasis* Cockerell, 1936. Pan-Pacific Ent. 12: 146. ♀.

**opacissima** Cockerell. Idaho, Wash. to Utah and Calif. Pollen: Unknown, but visits flowers of *Ceanothus cordulatus*, *Cryptantha intermedia*, *Lomatium*, *Salix lasiolepis*.

*Andrena opacissima* Cockerell, 1918. Ann. and Mag. Nat. Hist. (9) 1: 165. ♀.

Taxonomy: Cockerell, 1933. Pan-Pacific Ent. 9: 158. ♀. — Cockerell, 1936. Ann. and Mag. Nat. Hist. (10) 18: 632.

**opaciventris** Cockerell. Calif. Pollen: Unknown, but visits flowers of *Ceanothus crassifolius*, *C. integerrimus*, *C. vestitus*, *Cryptantha intermedia*, *Lomatium dasycarpum*, *Prunus*, *Ranunculus occidentalis*, *Rhamnus crocea*, *Salix lasiolepis*, *Sanicula tuberosa*, *S. bipinnatifida*.

*Andrena opaciventris* Cockerell, 1916. Pomona Jour. Ent. Zool. 8: 47. ♀.

**orthocarpi** Cockerell. Calif. Pollen: Unknown, but visits flowers of *Achillea millefolium*, *Calycadenia multiglandulosa*, *Ceanothus cuneatus*, *C. soredatus*, *Limnanthes douglasii*, *Lomatium utriculatum*, *Orthocarpus densiflorus*, *O. lithospermoides*, *Ranunculus californicus*, *Salix lasiolepis*, *Phoradendron*, *Thysanocarpus curvipes*.

*Andrena (Platandrena) orthocarpi* Cockerell, 1936. Pan-Pacific Ent. 12: 147. ♀.

Taxonomy: Lanham, 1947. Pan-Pacific Ent. 23: 72. ♂.

**pallidifovea** (Viereck). B. C. to Calif., Utah. Pollen: Collects pollen from the flowers of Compositae including *Chaenactis*, *Ericameria cooperi*, *Eriophyllum*, *Helianthus gracilentus*, *Layia*, but visits other flowers for nectar including *Gilia capitata*, *Lasthenia chrysostoma*.

*Pterandrena pallidifovea* Viereck, 1904. Canad. Ent. 36: 195, 227, 228. ♂, ♀.

*Andrena plumifera* Cockerell, 1916. Canad. Ent. 48: 393. ♀.

Taxonomy: Timberlake, 1951. In Linsley, In Muesebeck, Krombein and Townes, U. S. Dept. Agr., Agr. Monog. 2: 1075 (synonymy). — Timberlake, 1951. U. S. Natl. Mus., Proc. 101: 383. ♂.

**pensilis** Timberlake. Calif. Pollen: Unknown, but visits flowers of *Eriodictyon californicum*, *Eschscholzia californica*, *Lasthenia chrysostoma*, *Limnanthes douglasii*, *Layia platyglossa*, *Orthocarpus densiflorus*, *O. lithospermoides*, *Ranunculus californicus*, *Sisyrinchium bellum*.

*Andrena (Platandrena) pensilis* Timberlake, 1938. Pan-Pacific Ent. 14: 27. ♀, ♂.

**runcinatae** Cockerell. B. C. and Alta. to Colo., N. Dak.

*Andrena runcinatae* Cockerell, 1906. Amer. Mus. Nat. Hist., Bul. 22: 434. ♀, ♂.

**uvulariae** Mitchell. Md. (Beltsville). Pollen: Unknown, but visits flowers of *Uvularia sessilifolia*.

*Andrena* (?*Simandrena*) **uvulariae** Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 245, fig. 54. ♀.

**vexabilis** Timberlake. North. Calif. Pollen: Unknown, but visits flowers of *Achillea lanulosa*, *Agoseris heterophylla*, *Chamaebatia foliolosa*, *Coreopsis maritima*, *Cryptantha micrantha*, *Encelia californica*, *Eriophyllum confertiflorum*, *Lasthenia chrysostoma*, *L. gracilis*, *Layia platyglossa*, *Helianthella californica*, *Horkelia fusca*, *Senecio californicus*, *Viguiera*, *Wyethia angustifolia*.

*Andrena* (*Stenandrena*) **vexabilis** Timberlake, 1951. U. S. Natl. Mus., Proc. 101: 385. ♀, ♂.

**wheeleri** Graenicher. N. S. and Maine to Alta., south to Colo., Minn., Wis. and N. C. Pollen: Unknown, but visits flowers of *Centaurea*, *Chrysanthemum leucanthemum*, *Cornus*, *Rhododendron*, *Rubus*, *Sedum acre*.

*Andrena wheeleri* Graenicher, 1904. Ent. News 15: 65. ♀, ♂.

*Andrena wheeleri pallidior* Cockerell, 1938. Canad. Ent. 70: 7. ♀.

Taxonomy: Atwood, 1934. Canad. Jour. Res. 10: 208, 209. ♀, ♂ (key). — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 246-247, figs. 51-52 (redescription, synonymy).

### Genus ANDRENA Subgenus TAENIANDRENA Hedicke

*Andrena* subg. *Taeniandrena* Hedicke, 1933. Berlin Zool. Mus., Mitt. 19: 219.

Type-species: *Melitta ovatula* Kirby. Orig. desig.

Taxonomy: LaBerge, 1964. Nebr. Univ. State Mus., Bul. 4: 286, 292, 306-307 (tax. characters).

**wilkella** (Kirby). Holarctic; N. S. to Wis., south to Va. and Ohio. Presumably introduced.

Pollen: Apparently polylectic, visits flowers of *Achillea*, *Amorpha*, *Brassica*, *Cirsium*, *Crataegus*, *Daucus*, *Epilobium*, *Fragaria*, *Leontodon*, *Malus*, *Philadelphus*, *Pinus*, *Prunus*, *Raphanus*, *Rhododendron*, *Rhodura*, *Rubus*, *Solidago*, *Stellaria*, *Taraxacum*, *Trifolium*, *Vaccinium*.

*Melitta wilkella* Kirby, 1802. Monog. Apum Angliae, v. 2, p. 145. ♀, ♂.

*Andrena winkleyi* Viereck, 1907. Ent. News 18: 283, 285. ♀, ♂.

Taxonomy: Malloch, 1918. Biol. Soc. Wash., Proc. 31: 61. — Atwood, 1934. Canad. Jour. Res. 10: 207, 210. ♀, ♂ (key). — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 250-251, figs. 52, 54-55 (redescription).

Biology: Brittain, 1933. Canada Dept. Agr., Bul. 162: 94 (floral relationships). — Atwood, 1933. Canad. Jour. Res. 9: 456 (floral relationships). — Brittain and Newton, 1933. Canad. Jour. Res. 9: 341 (flower records). — Brittain and Newton, 1934. Canad. Jour. Res. 10: 261 (flower records).

### Genus ANDRENA Subgenus THYSANDRENA Lanham

*Andrena* subg. *Thysandrena* Lanham, 1949. Calif. Univ. Pubs. Ent. 8: 213.

Type-species: *Andrena candida* Smith. Orig. desig.

Taxonomy: LaBerge, 1964. Nebr. Univ. State Mus., Bul. 4: 287, 293, 294, 306 (tax. characters).

**argentiscopa** Viereck. Calif.

*Andrena* (*Andrena*) **argentiscopa** Viereck, 1917. Amer. Ent. Soc., Trans. 43: 368. ♀.

**beckeri** Cockerell. Colo.

*Andrena beckeri* Cockerell, 1921. Ann. and Mag. Nat. Hist. (9) 7: 211. ♀.

Taxonomy: Cockerell, 1932. Pan-Pacific Ent. 8: 175. — Lanham, 1941. Ent. Soc. Amer., Ann. 34: 706. ♀.

**bisalicis** Viereck. N. Dak. to New England states, south to Ga. Parasite: *Nomada* sp. Pollen:

Unknown, but visits flowers of *Amelanchier*, *Aronia*, *Brassica*, *Crataegus*, *Ilex*, *Prunus*, *Salix*.

*Andrena salicis* Robertson, 1891. Amer. Ent. Soc., Trans. 18: 53. ♀, ♂. Preocc.

*Andrena bisalicis* Viereck, 1908. Ent. News 19: 42. N. name.

*Andrena* (*Andrena*) **adelae** Viereck, 1922. Boston Soc. Nat. Hist., Occas. Papers 5: 37. ♀.

Taxonomy: Robertson, 1902. Amer. Ent. Soc., Trans. 28: 191, 192. ♀, ♂ (key). — Mitchell, 1958. In Krombein, U. S. Dept. Agr., Agr. Monog 2, First Suppl. p. 212 (synonymy).  
— Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 219-220, figs. 42-44, table 6 (redescription). — Yager and Rozen, 1966. Amer. Mus. Novitates 2265: 5, figs. 1-2 (pupa).

Biology: Rozen, 1966. Amer. Mus. Novitates 2244: 26 (parasite).

**brevipalpis** Cockerell, Colo.

*Andrena brevipalpis* Cockerell, 1930. Ann. and Mag. Nat. Hist. (10) 5: 109. ♀.

Taxonomy: Cockerell, 1932. Pan-Pacific Ent. 8: 175. ♀. — Cockerell, 1937. Amer. Mus. Novitates 899: 4. ♀.

**campanulae** Viereck and Cockerell, Colo., Nebr.

*Andrena campanulae* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 43: 38, 43. ♂, ♀.

Taxonomy: Cockerell, 1932. Pan-Pacific Ent. 8: 177. ♀, ♂.

**candida** Smith. B. C. to south. Calif., Colo. and Utah; Mexico (Baja California). Pollen:

Polylectic, visits a wide variety of flowers during both the first and second broods including *Acer grandidentatum*, *A. platynoides*, *Adenostoma fasciculatum*, *Alyssum maritimum*, *Amelanchier*, *Arctostaphylos glauca*, *Baccharis glutinosa*, *B. viminea*, *Brassica alba*, *B. adpressa*, *B. arvensis*, *B. campestris*, *B. nigra*, *Calandrinia menziesii*, *Ceanothus cordulatus*, *C. crassifolius*, *C. cuneatus*, *C. integriramus*, *C. orcuttii*, *C. palmeri*, *C. verrucosus*, *Chamaebatia foliolosa*, *Conium maculatum*, *Cryptantha flaccida*, *C. lepida*, *Cynopterus longipes*, *Daucus carota*, *Eriogonum fasciculatum*, *E. f. polifolii*, *Eriophyllum tridactylum*, *Gnaphalium bicolor*, *Isomeris arborea*, *Lomatium dasycarpum*, *L. grayi*, *Ligusticum vulgare*, *Lupinus paynei*, *Malus pumila*, *Medicago sativa*, *Melilotus alba*, *Nemophila menziesii*, *Phacelia affinis*, *P. distans*, *P. minor*, *P. ramosissima*, *Plagiobothrys tenellus*, *Prunus fremontii*, *P. ilicifolia*, *P. lyonii*, *P. subcordata*, *Ranunculus californicus*, *Rhamnus californica*, *R. crocea*, *R. ilicifolia*, *Salix argophylla*, *S. discolor*, *S. exigua*, *S. hindsiana*, *S. laevigata*, *S. lasiolepis*, *S. nigra*, *Salvia mellifera*, *Sambucus caerulea*, *Sisymbrium irio*, *S. officinale*.

*Andrena candida* Smith, 1879. Descr. New Species Hym. Brit. Mus., p. 56. ♀.

! *Andrena* (*Andrena*) *candida transserica* Viereck, 1917. Acad. Nat. Sci. Phila., Proc. 68: 533. ♀.

Taxonomy: Morice and Cockerell, 1901. Canad. Ent. 33: 155 (type). — Cockerell, 1906. Psyche 13: 10 (type). — Lanham, 1941. Ent. Soc. Amer., Ann. 34: 706, 708. ♀, ♂ (key). — Youssef and Bohart, 1968. Kans. Ent. Soc., Jour. 41: 450-455, figs. 2-7, 11-22 (immature stages).

Biology: Linsley, 1937. Brooklyn Ent. Soc., Bul. 32: 127 (floral relationships, spring and early summer broods). — Youssef and Bohart, 1968. Kans. Ent. Soc., Jour. 41: 442-455, 22 figs. (nest architecture, life history, floral relationships).

**ceanothina** Cockerell. Calif. Pollen: Unknown, but visits flowers of *Arctostaphylos*, *Ceanothus crassifolius*, *Ribes indecorum*.

*Andrena ceanothina* Cockerell, 1936. Pan-Pacific Ent. 12: 138. ♀.

**cercocarpi** Cockerell. Calif. Pollen: Unknown, but visits flowers of *Cercocarpus*.

*Andrena* (*Platanodrena*) *cercocarpi* Cockerell, 1936. Pan-Pacific Ent. 12: 140. ♀.

Taxonomy: Ribble, 1968. Nebr. Univ. State Mus., Bul. 8: 332 (subgeneric position).

**chlorinella** Viereck. Oreg.

*Andrena chlorinella* Viereck, 1904. Canad. Ent. 35: 189. ♀.

*Andrena xanthostigma* Viereck, 1904. Canad. Ent. 35: 193. ♀.

Taxonomy: Ribble, 1968. Nebr. Univ. State Mus., Bul. 8: 333 (subgeneric position).

**claremonti** Viereck. Calif.

*Andrena claremonti* Viereck, 1926. Pomona Jour. Ent. Zool. 18: 2. ♂.

**coloradina** Viereck and Cockerell. Colo.

*Andrena coloradina* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 53, 56. ♀.

Taxonomy: Cockerell, 1933. Pan-Pacific Ent. 9: 154. ♀ (key).

**fulvihirta** Viereck and Cockerell. B. C. to Colo. and Calif.

*Andrena fulvihirta* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 54. ♀.

- Andrena washingtoni manitouensis* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 31. ♂.
- Taxonomy: Timberlake, 1951. In Linsley, In Muesebeck, Krombein and Townes, U. S. Dept. Agr., Agr. Monog. 2: 1066 (synonymy).
- geranii** Robertson. New England states and Va., west to Minn. and Colo. Pollen: Unknown, but visits flowers of *Arabis*, *Blephilia*, *Geranium*, *Hydrophyllum*, *Osmorrhiza*, *Polemonium*.
- Andrena geranii* Robertson, 1891. Amer. Ent. Soc., Trans. 18: 54. ♀, ♂.
- Taxonomy: Robertson, 1902. Amer. Ent. Soc., Trans. 28: 190, 192. ♀, ♂ (key). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 221-222, figs. 44-45, table 6 (redescription).
- haroldi** Timberlake. Calif. Pollen: Unknown, but visits flowers of *Lasthenia*.
- Andrena (Micrandrena) haroldi* Timberlake, 1951. U. S. Natl. Mus., Proc. 101: 398. ♀, ♂.
- Taxonomy: Ribble, 1968. Nebr. Univ. State Mus., Bul. 8: 333 (subgeneric position).
- knuthiana** Cockerell. Oreg., Calif. Pollen: Unknown, but visits flowers of *Ceanothus cordulatus*, *Cryptantha lepida*, *Rhamnus californica*, *Salix*, *Sambucus velutina*.
- Andrena knuthiana* Cockerell, 1906. Ztschr. System. Hym. Dipt. 1: 80. ♀, ♂.
- Taxonomy: Cockerell, 1901. Ent. News 12: 74. ♀.
- lata** Viereck. N. S. to Minn., south to Ga. Pollen: Unknown, but visits flowers of *Brassica*, *Hydrangea*, *Potentilla*, *Prunus*, *Pyrus*, *Rubus*.
- Andrena (Andrena) lata* Viereck, 1922. Boston Soc. Nat. Hist., Occas. Papers 5: 39. ♀.
- Andrena (Andrena) vulgaris* Viereck, 1922. Boston Soc. Nat. Hist., Occas. Papers 5: 40. ♂.
- Taxonomy: Atwood, 1934. Canad. Jour. Res. 10 (2): 208, 210. ♀, ♂ (key). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 222-224, figs. 44-45, table 6 (redescription, synonymy).
- medionitens** Cockerell. B. C. and Alta. to Calif. and Colo. Pollen: Unknown, but visits flowers of *Cymopterus terebinthus*, *Eriogonum latifolium* var. *nudum*, *E. subscaposum*, *Erysimum asperum*, *Gilia tenuiflora*, *Hackelia jessicae*, *Holodiscus discolor*, *Horkelia bernardina*, *H. fusca*, *Oxytropis*, *Potentilla glandulosa*, *P. wheeleri*, *Sisymbrium incisum*, *Spraguea umbellata*, *Streptanthus tortuosus*.
- Andrena medionitens* Cockerell, 1902. Ann. and Mag. Nat. Hist. (7) 9: 101. ♀.
- Taxonomy: Viereck, 1904. Canad. Ent. 36: 192, 194. ♀, ♂. —Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 48. ♀ (variation).
- Biology: Clements and Long, 1923. Carnegie Inst. Wash., Pub. 336: 249 (ecology, as *madronitens*).
- phaceliae** Mitchell. Md., Va., Ill. Pollen: Unknown, but visits flowers of *Alsine pubera*, *Phacelia dubia*, *P. purshii*.
- Andrena (Thysandrena) phaceliae* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 224, figs. 44, 45. ♀, ♂.
- phocata** Cockerell. Colo.
- Andrena phocata* Cockerell, 1910. Canad. Ent. 42: 369. ♀.
- subcandida** Viereck. B. C. to Calif.
- Andrena subcandida* Viereck, 1904. Canad. Ent. 36: 193. ♀.
- subdistans** Viereck. Wash., Oreg.
- Andrena subdistans* Viereck, 1904. Canad. Ent. 36: 193. ♀.
- subtrita** Cockerell. Nev.
- Andrena subtrita* Cockerell, 1910. Ann. and Mag. Nat. Hist. (8) 5: 263. ♀.
- taeniata** Viereck. Calif.
- Andrena (Andrena) taeniata* Viereck, 1916. Acad. Nat. Sci. Phila., Proc. 68: 538. ♀.
- trizonata** (Ashmead). Colo.
- Cilissa trizonata* Ashmead, 1890. Colo. Biol. Assoc., Bul. 1: 6. ♀.
- vierecki** Cockerell. Utah, Colo., Calif. Parasite: *Myopa rubida* (Bigot).
- Andrena vierecki* Cockerell, 1904. Ann. and Mag. Nat. Hist. (7) 14: 26. ♀.
- Andrena boharti* Linsley, 1939. Pan-Pacific Ent. 15: 159. ♀, ♂.

Taxonomy: Lanham, 1941. Ent. Soc. Amer., Ann. 34: 706, 707. ♀, ♂ (key). —Timberlake, 1951. In Linsley, M. Muesebeck, Krombein and Townes, U. S. Dept. Agr., Agr. Monog. 2: 1085 (synonymy).

Biology: MacSwain and Bohart, 1947. Pan-Pacific Ent. 23: 30 (parasite).

**w-scripta** Viereck. B. C. to Calif. Pollen: Unknown, but visits flowers of *Acacia greggii*, *Adenostoma fasciculatum*, *Arctostaphylos glandulosa*, *A. mariposa*, *A. patula*, *A. pungens*, *Ceanothus cordulatus*, *C. cuneatus*, *C. greggii*, *C. soredatus*, *Chamaebatia foliolosa*, *Claytonia spatulata*, *Cryptantha intermedia*, *C. lepida*, *Daucus carota*, *Eriogonum fasciculatum*, *Eriophyllum confertiflorum*, *Fritillaria*, *Heteromeles arbutifolia*, *Holodiscus discolor*, *Horkelia*, *Lasthenia chrysostoma*, *Lomatium*, *Lotus scoparius*, *Phacelia distans*, *Prunus ilicifolia*, *Ranunculus californicus*, *Rhamnus californicus*, *Salix laevigata*.  
*Andrena w-scripta* Viereck, 1904. Canad. Ent. 36: 193, 194. ♀, ♂.

### Genus ANDRENA Subgenus TRACHANDRENA Robertson

*Trachandrena* Robertson, 1902. Amer. Ent. Soc., Trans. 28: 189.

Type-species: *Andrena rugosa* Robertson. Orig. desig.

All the species of this subgenus, except the Eurasian *Andrena lagopus* Latreille, are centered in America north of Mexico and are not known to occur south of the United States.

Revision: LaBerge, 1973. Amer. Ent. Soc., Trans. 99: 235-371, 69 figs., 2 tables, 15 maps (N. Amer. spp.).

Taxonomy: Lanham, 1949. Calif. Univ. Pubs. Ent. 8: 216 (tax. characters). —LaBerge, 1964. Nebr. Univ. State Mus., Bul. 4: 282, 292, 308 (tax. characters). —Warneke, 1968. Coimbra Univ. Est. Mus. Zool., Mem. 307: 68-69 (tax. status).

**amphibola** (Viereck). B. C. south to Calif., east to Alta., Mont. Wyo., Nebr. and Colo. Pollen: Apparently polylectic, visits flowers of *Astragalus*, *Daucus pusilla*, *Drymocallis*, *Eriogonum flavum*, *Geum triflorum*, *Holodiscus discolor*, *Iris*, *Lappula floribunda*, *Lonicera*, *Lupinus*, *Medicago sativa*, *Penstemon*, *Phacelia*, *Potentilla*, *Salix*, *Senecio*, *Symphoricarpos*, *Taraxacum officinale*, *Thermopsis divaricata*.  
*Trachandrena amphibola* Viereck, 1904. Canad. Ent. 35: 158, 159. ♀, ♂.  
*Trachandrena crassihirta* Viereck, 1904. Canad. Ent. 35: 158. ♀.  
*Trachandrena perdensa* Viereck, 1904. Canad. Ent. 35: 158. ♀.  
*Trachandrena hadra* Viereck, 1904. Canad. Ent. 35: 158. ♀.  
*Trachandrena limarea* Viereck, 1904. Canad. Ent. 36: 158, 159. ♀, ♂.  
*Andrena* (*Trachandrena*) *eriogoni* Cockerell, 1927. Ent. Soc. Amer., Ann. 20: 397. ♀.  
*Andrena* (*Trachandrena*) *seneciophila* Cockerell, 1928. Psyche 35: 62. ♀.

Taxonomy: Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 10. ♀ (as *perdensa*). —Lanham, 1914. Ent. Soc. Amer. Ann. 34: 704. ♀ (key, as *seneciophila*). —LaBerge, 1973. Amer. Ent. Soc., Trans. 99: 284-292, figs. 1, 7, 34-35 (redescription, synonymy, variation in color of vestiture).

**ceanothi** Viereck. N. S. and Que., south to Ga., west to Minn. and Colo. Pollen: Polylectic, visits flowers of *Amelanchier*, *Amorpha fruticosa*, *Barbarea vulgaris*, *Ceanothus americanus*, *Cerasus serotina*, *Chamaedaphne*, *Chrysanthemum leucanthemum*, *Cornus candidissimus*, *Crataegus*, *Fragaria*, *Ledum*, *Prunus*, *Ptelea*, *Rhus*, *Rubus argutus*, *R. villosus*, *Salix*, *Taraxacum officinale*, *Vaccinium angustifolium*, *Viburnum*, *Waldsteinia*.

*Andrena* (*Trachandrena*) *ceanothi* Viereck, 1917. Amer. Ent. Soc., Trans. 43: 404. ♀ (♂ misdet.).

*Andrena* (*Trachandrena*) *compacta* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 181. ♂.

Taxonomy: Cockerell, 1931. Amer. Mus. Novitates 458: 17. ♀ (key). —Atwood, 1934. Canad. Jour. Res. 10: 212. ♀, ♂. —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 179-180, figs. 35-36, table 5 (redescription, synonymy). —LaBerge, 1973. Amer. Ent. Soc., Trans. 99: 346-349, figs. 1, 12, 58, 59 (redescription, synonymy).

Biology: LaBerge, 1973. Amer. Ent. Soc., Trans. 99: 349 (floral relationships).

**cleodora cleodora** (Viereck). B. C. to north. Calif., east to Mont., Wyo. and Colo., ?Ariz. (Santa Catalina Mts.). Pollen: Oligolege of *Ceanothus* including *C. cuneatus*, *C. integerrimus*, *C. laevigatus*, but visits other flowers presumably for nectar including *Arctostaphylos*, *Aster*, *Chamaebatia foliolosa*, *Conium maculatum*, *Eriogonum nudum*, *Lupinus*, *Phacelia*, *Prunus*, *Rhamnus*, *Ribes*, *Salix*, *Sorbus*.

*Trachandrena cleodora* Viereck, 1904. Canad. Ent. 35: 158. ♀.

*Andrena* (*Trachandrena*) *lutzi* Cockerell, 1931. Amer. Mus. Novitates 458: 12. ♀.

Taxonomy: Cockerell, 1932. Pan-Pacific Ent. 8: 173. ♂. — LaBerge, 1973. Amer. Ent. Soc., Trans. 99: 323-326, figs. 1, 12, 48-49 (redescription).

Biology: LaBerge, 1973. Amer. Ent. Soc., Trans. 99: 327 (floral relationships).

**cleodora melanodora** Cockerell. South. Calif. Pollen: Oligolege of *Ceanothus* including *C. cordulatus*, *C. integerrimus*, *C. palmeri*, but visits other flowers presumably for nectar including *Arctostaphylos patula*, *Barbarea orthoceras*, *Cryptantha lepida*, *Eriodictyon californicum*, *Prunus emarginata*, *P. ilicifolia*, *Pyrus malus*, *Rhamnus californica*.

*Andrena* (*Trachandrena*) *melanodora* Cockerell, 1932. Pan-Pacific Ent. 8: 173. ♀.

Taxonomy: LaBerge, 1973. Amer. Ent. Soc., Trans. 99: 326-327, figs. 48-49 (redescription).

Biology: LaBerge, 1973. Amer. Ent. Soc., Trans. 99: 327 (floral relationships).

**cupreotincta** Cockerell. B. C., Alta. and Sask., south to Calif., Nev., Utah and N. Mex. Pollen:

Apparently polylectic, visits flowers of *Abies concolor*, *Arctostaphylos nevadensis*, *Ceanothus integerrimus*, *Eriogonum*, *Hackelia*, *Lesquerella*, *Penstemon*, *Prunus virginiana demissa*, *Pyrus malus*, *Rhamnus californica*, *R. rubra*, *Ribes inerme*, *Rubus*, *Salix*, *Taxaracum officinale*.

*Andrena cupreotincta* Cockerell, 1901. Canad. Ent. 33: 153. ♀.

*Trachandrena ochreopleura* Viereck, 1904. Canad. Ent. 35: 158. ♀.

*Andrena* (*Trachandrena*) *swenki* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 3. ♀.

*Andrena* (*Trachandrena*) *jockorum* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 3. ♂.

*Trachandrena abjecta* Cockerell, 1929. N. Y. Ent. Soc., Jour. 37: 445. ♀.

Taxonomy: Viereck, 1904. Canad. Ent. 36: 158. ♀ (key). — Cockerell, 1937. Ent. News 49: 257. ♀ (as *abjecta*). — LaBerge, 1973. Amer. Ent. Soc., Trans. 99: 315-321, figs. 1, 11, 46-47 (redescription, synonymy).

Biology: LaBerge, 1973. Amer. Ent. Soc., Trans. 99: 321 (floral relationships).

**cyanophila** Cockerell. B. C. and Alta., south to Calif., Nev. and Ariz. Pollen: Apparently polylectic, visits flowers of *Argentina anserina*, *Ceanothus fendleri*, *Euphorbia*, *Geranium fremontii*, *Oreocarya nana*, *Pinus ponderosa*, *Polemonium*, *Potentilla arguta*, *P. glandulosa*, *Prunus melanocarpa*, *Ranunculus Montensis*, *Ribes longiflorum*, *Senecio perplexis*, *Taxaracum officinale*.

*Andrena cyanophila* Cockerell, 1906. Amer. Mus. Nat. Hist., Bul. 22: 431. ♀.

*Andrena tacitula* Cockerell, 1910. Ann. and Mag. Nat. Hist. (8) 5: 262. ♂.

Taxonomy: Cockerell, 1916. Canad. Ent. 48: 253. — Lanham, 1941. Ent. Soc. Amer., Ann. 34: 704, 707. ♀, ♂ (key). — LaBerge, 1973. Amer. Ent. Soc., Trans. 99: 353-357, figs. 1, 10, 64-65 (redescription, synonymy).

Biology: LaBerge, 1973. Amer. Ent. Soc., Trans. 99: 357 (floral relationships).

**forbesii** Robertson. N. S. to B. C., south to Ga., west to Wash., Oreg. and Calif. Pollen:

Polylectic, apparently prefers pollens of Rosaceae and Salicaceae over other sources; visitation records include *Acer negundo*, *Alliaria officinalis*, *Amelanchier arborea*, *A. canadensis*, *Aronia melanocarpa*, *Astragalus*, *Barbarea vulgaris*, *Berberis vulgaris*, *Brauneria purpurea*, *Callirhoe digitata*, *Cardamine bulbosa*, *Ceanothus ovatus*, *Cercis canadensis*, *Claytonia caroliniana*, *C. virginica*, *Cornus florida*, *C. mas*, *Crataegus*, *Dentaria laciniata*, *Erythronium americanum*, *Euphorbia commutata*, *Forsythia suspensa*, *Fragaria virginiana*, *Heracleum lanatum*, *Hieracium*, *Ilex*, *Lappula*

*heterosperma*, *Lepargyrea canadensis*, *Lomatium daucifolium*, *L. foeniculaceum*, *Lonicera*, *Melilotus alba*, *M. officinalis*, *Paeonia*, *Pastinaca sativa*, *Physocarpus opulifolius*, *Populus deltoides*, *Prunus americanus*, *P. demissa*, *P. melanocarpa*, *P. serotina*, *P. virginiana*, *Ptelea*, *Pyracantha*, *Pyrus leonis*, *P. malus*, *Ranunculus abortivus*, *Rhamnus lanceolatus*, *Rhus aromatica*, *R. canadensis*, *R. toxicodendron*, *Ribes gracile*, *Rosa*, *Rubus argenteus*, *Salix discolor*, *S. nigra*, *Sedum ternatum*, *Shepherdia argentea*, *Spiraea aruncus*, *S. latifolia*, *Symphoricarpos*, *Tamarix gallica*, *Taraxacum officinale*, *Thlaspi arvense*, *Vaccinium*, *Viburnum opulus*, *V. prunifolium*, *Zizia aurea*.

*Andrena forbesii* Robertson, 1891. Amer. Ent. Soc., Trans. 18: 59. ♀.

*Trachandrena indotata* Viereck, 1904. Canad. Ent. 36: 158, 159. ♀, ♂.

*Andrena (Trachandrena) lincolni* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 13. ♀.

*Andrena (Trachandrena) rodecki* Cockerell, 1929. Ent. Soc. Amer., Ann. 22: 755. ♀.

*Andrena (Trachandrena) pyracanthae* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 194, fig. 35. ♀.

Taxonomy: Robertson, 1902. Amer. Ent. Soc., Trans. 28: 189, 190. ♀, ♂. —Cockerell, 1931. Amer. Mus. Novitates 458: 16. ♀. (as *rodecki*). —Cockerell, 1931. Amer. Mus. Novitates 458: 17 (key, as *lincolni*). —Atwood, 1934. Canad. Jour. Res. 10: 208, 209, figs. ♀, ♂ (key). —Lanham, 1941. Ent. Soc. Amer., Ann. 34: 704, 707. ♀, ♂ (key). —Lanham, 1941. Ent. Soc. Amer., Ann. 34: 704. ♀ (key, as *lincolni*). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 183-184, figs. 35-36, table 5 (redescription). —LaBerge, 1973. Amer. Ent. Soc., Trans. 99: 261-267, figs. 1, 4, 24-25 (redescription, synonymy, geogr. variation).

Biology: LaBerge, 1973. Amer. Ent. Soc., Trans. 99: 266-267, table 1 (floral relationships).  
*fuscauda* (Viereck). B. C. to Calif. and west. Nev. and Ariz. (Yuma). Pollen: Apparently polylectic, visits flowers of *Arctostaphylos patula*, *Berberis*, *Ceanothus cordulatus*, *C. integerrimus*, *C. leucodermis*, *C. palmeri*, *C. soredatus*, *Chamaebatia foliolosa*, *Cryptantha intermedia*, *Eriodictyon californicum*, *Eriogonum*, *Gilia*, *Horkelia parryi*, *Malus*, *Nemophila menziesii*, *Pinus ponderosa*, *Potentilla*, *Prunus demissa*, *P. emarginata*, *P. ilicifolia*, *P. subcordata*, *Quercus dumosa*, *Rhamnus californica*, *R. crocea*, *Salix laevigata*, *Taraxacum denselonis*.

*Trachandrena fuscauda* Viereck, 1904. Canad. Ent. 35: 159. ♀.

*Andrena (Trachandrena) californica* Timberlake, 1951. U. S. Natl. Mus., Proc. 101: 373. ♀, ♂.

*Andrena (Trachandrena) californica wickhami* Timberlake, 1951. U. S. Natl. Mus., Proc. 101: 375. ♀.

Taxonomy: LaBerge, 1973. Amer. Ent. Soc., Trans. 99: 357-361, figs. 1, 14, 66-67 (redescription, synonymy).

Biology: LaBerge, 1973. Amer. Ent. Soc., Trans. 99: 361 (floral relationships).

*heraclei* Robertson. N. Y. to N. C., west to Kans. Pollen: Unknown, but visits flowers of *Camassia esculenta*, *Celastrus scandens*, *Cercis canadensis*, *Crataegus*, *Cornus*, *Heracleum*, *Pastinaca sativa*, *Prunus*, *Ptelea*, *Salix*, *Taenidia*, *Washingtonia longistylus*.

*Andrena heraclei* Robertson, 1897. Acad. Sci. St. Louis, Trans. 7: 336. ♀.

Taxonomy: Robertson, 1902. Amer. Ent. Soc., Trans. 28: 189. ♀. —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 184, fig. 35, table 5 (redescription). —LaBerge, 1973. Amer. Ent. Soc., Trans. 99: 343-346, figs. 1, 3, 56-57 (redescription).

*hippotes* Robertson. N. S. to B. C., south to Ga., west to Wash., Oreg. and north. Calif. Pollen: Polylectic, visits a wide variety of flowers including *Acer*, *Aesculus glabra sargentii*, *Amelanchier arborea*, *Amorpha canescens*, *Angelica atropurpurea*, *Barbarea vulgaris*, *Berberis*, *Caltha palustris*, *Camassia esculenta*, *Ceanothus ovatus*, *Celastrus*, *Cercis canadensis*, *Chamaedaphne*, *Claytonia*, *Cornus mas*, *Crataegus mollis*, *Daucus carota*, *Dentaria laciniata*, *Descurainia intermedia*, *Echinacea angustifolia*, *E. purpurea*, *Erucella*, *Euphorbia*, *Fragaria*, *Fraxinus*, *Hieracium*, *Ligustrum vulgare*, *Lomatium triternatum*, *Lonicera fragrantissima*, *Melilotus alba*, *M. officinalis*, *Nyssa sylvatica*,



*Paonia*, *Pastinaca sativa*, *Phacelia*, *Physocarpus opulifolius*, *Potentilla anserina*, *Prunus americana*, *P. demissa*, *P. serotina*, *P. virginiana*, *Ptelea*, *Pyracantha yunnanensis*, *Pyrus malus*, *Ranunculus abortivus*, *Rhamnus*, *Rhus glabra*, *Ribes aureum*, *Rosa carolina*, *Rubus*, *Salix nigra*, *Shepherdia argentea*, *Spiraea discolor*, *S. sorbifolia*, *Sphaeralcea coccinea*, *Symphoricarpos*, *Taraxacum officinale*, *Thlaspi arvense*, *Trollius laxa*, *Vaccinium*, *Viburnum dentatum*, *V. opulus*, *Zizia aurea*.

*Audrena hippotes* Robertson, 1895. Amer. Ent. Soc., Trans. 22: 120. ♀, ♂.

*Audrena (Trachandrena) perforatella* Cockerell, 1906. Ann. and Mag. Nat. Hist. (7) 17: 306. ♀.

*Audrena (Trachandrena) arenakensis* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 177, fig. 35. ♀.

Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 184-185, figs. 35, 37, table 5 (redescription, synonymy). — LaBerge, 1973. Amer. Ent. Soc., Trans. 99: 292-299, figs. 1, 8, 36-37 (redescription, synonymy).

Biology: LaBerge, 1973. Amer. Ent. Soc., Trans. 99: 298, table 2 (floral relationships).

*mariae* Robertson. N. S. to N. W. T. and B. C., south to Ga., west to N. Mex., Utah, Idaho and Wash. Pollen: Oligolege of *Salix* including *S. babylonica*, *S. bebbiana*, *S. nigra*, *S. tristis*, but visits other flowers including *Amelanchier*, *Astragalus*, *Barbarea vulgaris*, *Cogswellia*, *Comandra*, *Crataegus mollis*, *Eriogonum*, *Erigeron philadelphicus*, *Erythronium*, *Fragaria*, *Hackelia floribunda*, *Kalmia*, *Lomatium daucifolium*, *L. foeniculaceum*, *Pastinaca sativa*, *Prunus americana*, *Pulsatilla*, *Pyrus malus*, *Ribes gracile*, *Rubus*, *Sisymbrium*, *Spiraea*, *Taraxacum officinale*.

*Audrena mariae* Robertson, 1891. Amer. Ent. Soc., Trans. 18: 58. ♀, ♂.

*Audrena sphecodina* Cockerell and Casad, 1896. Ann. and Mag. Nat. Hist. (6) 18: 78. ♀, ♂.

*Audrena mariae* var. *concolor* Robertson, 1898. Acad. Sci. St. Louis, Trans. 8: 46. ♀, ♂.

*Audrena (Trachandrena) submariae* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 4. ♀.

*Audrena (Trachandrena) martialis* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 5. ♂.

*Audrena (Trachandrena) sphecodiniformis* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 6. ♂.

*Audrena (Trachandrena) profundiformis* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 8. ♂.

*Audrena (Trachandrena) stricklandi* Cockerell, 1936. Canad. Ent. 68: 275. ♀.

Taxonomy: Robertson, 1902. Amer. Ent. Soc., Trans. 28: 189, 190. ♀, ♂. — Viereck, 1907. Ent. News 18: 284, 286. ♀, ♂ (key). — Cockerell, 1929. Ent. Soc. Amer., Ann. 22: 754 (as *martialis*). — Cockerell, 1929. Ent. Soc. Amer., Ann. 22: 754 (as *sphecodina*). — Atwood, 1934. Canad. Jour. Res. 10: 208, 210. ♀, ♂ (key). — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 187-188, figs. 35, 38, table 5 (redescription). — LaBerge, 1973. Amer. Ent. Soc., Trans. 99: 299-305, figs. 1, 9, 39-41 (redescription, synonymy).

Biology: LaBerge, 1973. Amer. Ent. Soc., Trans. 99: 305 (floral relationships).

*miranda* Smith. N. S. to N. J. and Pa., west to Alaska, south to N. Mex., Ariz., Nev. and Calif. (Alta and Carrville). Parasite: *Stylops* sp. Pollen: Polylectic, visits a wide variety of flowers including *Achillea millefolium*, *Angelica*, *Aralia latifolia*, *Argemone*, *Astragalus*, *Barbarea vulgaris*, *Blepharipappus*, *Brassica campestris*, *Ceanothus*, *Cirsium undulatum*, *Cornus*, *Crataegus*, *Drymocallis arguta*, *Euthorbia*, *Geranium richardsoni*, *Heracleum lanatum*, *Lappula heterosperma*, *Lotus corniculatus*, *Malvastrum*, *Melilotus alba*, *M. officinalis*, *Pastinaca sativa*, *Potentilla fruticosa*, *P. recta*, *Prunus virginiana demissa*, *Ranunculus septentrionalis*, *Ribes*, *Rosa arkansana*, *R. carolina*, *R. multiflora*, *Rubus adoratus*, *Rudbeckia hirta*, *Sanicula marilandica*, *Spiraea latifolia*, *S. sorbifolia*, *Symphoricarpos occidentalis*, *Taraxacum officinale*, *Vaccinium*, *Viburnum opulus*, *Waldsteinia fragarioides*, *Zizia aptera*, *Z. aurea*.

*Audrena miranda* Smith, 1879. Desc. New Species Hym. Brit. Mus., p. 54. ♀, ♂.

*Audrena grandior* Cockerell, 1897. Entomologist 30: 307. ♀.

*Audrena multiplicata* Cockerell, 1902. Canad. Ent. 34: 46. ♀.

*Audrena multiplicatiformis* Viereck, 1907. Ent. News 18: 284. ♀.

Taxonomy: Morice and Cockerell, 1901. *Canad. Ent.* 33: 153. ♀, ♂ (types). —Cockerell, 1906. *Psyche* 13: 34 (type). —Atwood, 1934. *Canad. Jour. Res.* 10: 208, 210. ♀, ♂ (key). —Atwood, 1934. *Canad. Jour. Res.* 10 (2): 208, 210 (as *grandior*). —Timberlake, 1951. *In* Linsley, *In* Muesebeck and Krombein and Townes, U. S. Dept. Agr., Agr. Monog. 2: 1072 (synonymy). —Mitchell, 1958. *In* Krombein, U. S. Dept. Agr., Agr. Monog. 2, First Suppl. p. 215 (synonymy). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 190-191, figs. 35, 38, table 5 (redescription, synonymy). —LaBerge, 1973. *Amer. Ent. Soc., Trans.* 99: 267-273, figs. 1, 5, 26-27 (redescription).

Biology: LaBerge, 1973. *Amer. Ent. Soc., Trans.* 99: 272-273 (floral relationships, stylization).

*nuda* Robertson. Maine to Ga., west to Tex., N. Mex., Utah and Wyo. Pollen: Polylectic, although with a preference for flowers of the Rosaceae: visitation records include *Aruncus*, *Benzoin aestivale*, *Cercocarpus*, *Claytonia*, *Conium*, *Crataegus mollis*, *Erigenia*, *Euphorbia*, *Heracleum*, *Ilex*, *Lomatium dissectum*, *Melilotus officinalis*, *Myosotis*, *Pastinaca sativa*, *Penstemon*, *Prunus americana*, *P. serotina*, *P. virginica*, *Ptelea*, *Pyracantha*, *Pyrus leonis*, *P. malus*, *P. pyrus*, *Rhamnus lanceolata*, *Rhus*, *Rubus argutus*, *Salix*, *Sanicula*, *Sassafras*, *Staphylea*, *Symplocos*, *Taenidia*, *Viburnum prunifolium*, *Zizia*.

*Andrena nuda* Robertson, 1891. *Amer. Ent. Soc., Trans.* 18: 57. ♀.

*Andrena (Trachandrena) davisiana* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 6. ♂.

*Andrena (Trachandrena) pseudobscura* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 193, fig. 36. ♂.

Taxonomy: Robertson, 1902. *Amer. Ent. Soc., Trans.* 28: 189. ♀ (key). —Lanham, 1941. *Ent. Soc. Amer., Ann.* 34: 704. ♀ (key). —Lanham, 1941. *Ent. Soc. Amer., Ann.* 34: 707. ♂ (key, as *davisiana*). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 192-193, fig. 35 (redescription). —LaBerge, 1973. *Amer. Ent. Soc., Trans.* 99: 333-338, figs. 1, 14, 52-53 (redescription, synonymy).

Biology: LaBerge, 1973. *Amer. Ent. Soc., Trans.* 99: 337-338 (floral relationships).

*quintiliformis* Viereck. B. C. to Calif., east to Idaho, Nev. and Utah. Pollen: Apparently polylectic, visits flowers of *Achillea millefolium*, *Allium*, *Arctostaphylos*, *Ceanothus cuneatus*, *C. laevigatus*, *Chamaebatia foliolosa*, *Cirsium*, *Eriogonum*, *Lappula*, *Lomatium triternatum*, *Phacelia humilis*, *Ranunculus*, *Salix*, *Solidago californica*. *Andrena (Trachandrena) quintiliformis* Viereck, 1916. *Acad. Nat. Sci. Phila., Proc.* 68: 606. ♀.

*Andrena (Trachandrena) coactifera* Viereck, 1926. *Calif. Acad. Sci., Proc.* (4) 15: 399. ♀.

Taxonomy: LaBerge, 1973. *Amer. Ent. Soc., Trans.* 99: 278-281, figs. 1, 6, 30-31 (redescription, synonymy).

Biology: LaBerge, 1973. *Amer. Ent. Soc., Trans.* 99: 281 (floral relationships).

*quintilis* Robertson. Wis. and Ill., west to N. Dak., S. Dak., Nebr., Colo. and Kans. Pollen: Polylectic, although exhibits a decided preference for the pollen and nectar of *Amorpha* including *A. canescens*, *A. fruticosa*, but visits other flowers including *Apocynum cannabinum*, *Chrysanthemum leucanthemum*, *Crataegus*, *Drymocallis arguta*, *Echinacea angustifolia*, *Erigeron ramosus*, *Pastinaca sativa*, *Ptelea*, *Pycnanthemum flexuosum*, *P. linifolium*, *Salix*, *Symphoricarpos*, *Zizia aurea*. *Andrena quintilis* Robertson, 1898. *Acad. Sci. St. Louis, Trans.* 8: 46. ♀.

Taxonomy: Robertson, 1902. *Amer. Ent. Soc., Trans.* 28: 189. ♀ (key). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 14: 195-196, fig. 35, table 5 (redescription). —LaBerge, 1973. *Amer. Ent. Soc., Trans.* 99: 281-284, figs. 1, 6, 32-33 (redescription).

Biology: LaBerge, 1973. *Amer. Ent. Soc., Trans.* 99: 284 (floral relationships).

*rehni* Viereck. Que. and Ont., south to G., west to Wis. Pollen: Apparently polylectic, visits flowers of *Aruncus dioecium*, *Castanea pumila*, *Ceanothus*, *Chrysanthemum leucanthemum*, *Cicuta maniculata*, *Hydrangea*, *Ilex opaca*, *Quercus prinoides*, *Salix*. *Andrena rehni* Viereck, 1907. *Ent. News* 18: 284. ♀.

*Andrena (Trachandrena) votula* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 204. ♀.

Taxonomy: LaBerge, 1973. Amer. Ent. Soc., Trans. 99: 349-353, figs. 1, 15, 60-63 (redescription, synonymy).

**rugosa** Robertson. Que. and New England, south to Ga., west to Minn. and Nebr. Pollen:

Polylectic, visits flowers of *Acer*, *Amelanchier arborea*, *A. canadensis*, *Angelica*, *Astragalus*, *Barbarea vulgaris*, *Brassica arvensis*, *Claytonia virginica*, *Cornus mas*, *Crataegus punctata*, *Dentaria laciniata*, *Dirca*, *Erigenia bulbosa*, *Fragaria*, *Geranium*, *Hepatica*, *Heracleum*, *Isopyrum*, *Macrocalyx nyctelea*, *Melilotus officinalis*, *Paeonia*, *Pastinaca sativa*, *Physocarpus opulifolius*, *Prunus americana*, *P. virginiana*, *Ptelea*, *Pyracantha*, *Pyrus malus*, *Rhus*, *Ribes*, *Rosa multiflora*, *Rubus argutus*, *R. occidentalis*, *Salix*, *Sanicula*, *Spiraea aruncus*, *Symphoricarpos*, *Taraxacum officinale*, *Viburnum*, *Zanthoxylum*, *Zizia aurea*.

*Andrena rugosa* Robertson, 1891. Amer. Ent. Soc., Trans. 18: 58. ♀, ♂.

*Andrena paenerugosa* Viereck, 1907. Ent. News 18: 285. ♀.

Taxonomy: Robertson, 1902. Amer. Ent. Soc., Trans. 28: 189, 190. ♀, ♂ (key). —Atwood, 1934. Canad. Jour. Res. 10: 208, 210. ♀, ♂ (key). —Mitchell, 1960. N. C. Expt. Sta. Tech. Bul. 141: 198-199, figs. 35-36, table 5 (redescription, synonymy). —LaBerge, 1973. Amer. Ent. Soc., Trans. 99: 327-332, figs. 1, 13, 50-51 (redescription).

Biology: LaBerge, 1973. Amer. Ent. Soc., Trans. 99: 332 (floral relationships).

**salicifloris** Cockerell. B. C. and Alta., south to Calif., Nev., Utah and Colo. Pollen: Polylectic, but with some predilection for the flowers of *Salix*; visitation records include *Acacia*, *Acer*, *Amelanchier*, *Arctostaphylos*, *Berberis*, *Brassica*, *Ceanothus*, *Cerastium oreophyllum*, *Chamaebatia foliolosa*, *Cicuta*, *Cistus*, *Epilobium angustifolium*, *Eriogonum*, *Geranium*, *Grossularia*, *Hackelia patens*, *Hieracium lanatum*, *Lasthenia*, *Lepidium*, *Lomatium dissectum*, *L. triternatum*, *Pastinaca sativa*, *Prunus demissa*, *P. ilicifolia*, *P. virginiana*, *Pulsatilla patens*, *Pyracantha yunnanensis*, *Pyrus malus*, *Ranunculus californicus*, *Ribes lacustre*, *Rubus nutkana*, *R. ursinus*, *R. vitifolius*, *Taraxacum densileonis*, *T. officinalis*.

*Andrena salicifloris* Cockerell, 1897. Acad. Nat. Sci. Phila., Proc. 49: 351. ♀.

*Trachandrena auricauda* Viereck, 1904. Canad. Ent. 35: 159, 161. ♀.

*Andrena (Trachandrena) tacitula* var. *grossulariae* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 9. ♂.

*Andrena (Trachandrena) nortoni* Viereck, 1916. Acad. Nat. Sci. Phila., Proc. 68: 602. ♀, ♂.

*Andrena (Trachandrena) veris* Cockerell, 1934. Pan-Pacific Ent. 9: 156. ♀, ♂.

Taxonomy: Viereck, 1904. Canad. Ent. 36: 158, 159. ♀, ♂ (variation). —Lanham, 1941. Ent. Soc. Amer., Ann. 34: 704, 707. ♀, ♂ (key, as *veris*). —LaBerge, 1973. Amer. Ent. Soc., Trans. 99: 255-261, figs. 1, 3, 22-23 (redescription, synonymy).

Biology: LaBerge, 1973. Amer. Ent. Soc., Trans. 99: 260 (floral relationships).

**semipunctata** Cockerell. Wash. to south. Calif., east to southeast. Utah and southwest. N. Mex.

Pollen: Oligolege of *Salix* including *S. exigua*, *S. hindsiana*, *S. laevigata*, *S. lasiolepis*, *S. nigra*, but visits other flowers presumably for nectar including *Baccharis*, *Ceanothus soredatus*, *Prunus*, *Pyrus malus*, *Rhus trilobata*, *Sambucus*, *Senecio salignifolia*, *Sisymbrium irio*, *Tamarix gallica*, *Taraxacum officinale*.

*Andrena semipunctata* Cockerell, 1902. Ann. and Mag. Nat. Hist. (7) 9: 102. ♀.

Taxonomy: Viereck, 1904. Canad. Ent. 36: 159. ♀, ♂ (key). —LaBerge, 1973. Amer. Ent. Soc., Trans. 99: 311-315, figs. 1, 9, 44-45 (redescription).

Biology: Linsley, 1937. Brooklyn Ent. Soc., Bul. 32: 127 (floral relationships, adult behavior).

**sigmundi** Cockerell. N. B. south to Ga., west to B. C., south to Calif., Utah and N. Mex. Pollen:

Oligolege of *Salix* including *S. bebbiana*, *S. discolor*, but visits other flowers including *Acer saccharinum*, *Amelanchier canadensis*, *Barbarea vulgaris*, *Ceanothus fendleri*, *Crataegus*, *Fragaria virginiana*, *Fraxinus*, *Kalmia latifolia*, *Lepargyrea argentea*, *L. canadensis*, *Melilotus alba*, *Populus*, *Potentilla*, *Prunus demissa*, *P. virginiana*,

*Pulsatilla ludoviciana*, *Spiraea*, *Taraxacum officinale*, *Vaccinium angustifolium*, *Waldsteinia fragarioides*.

*Andrena sigmundi* Cockerell, 1902. Canad. Ent. 34: 45. ♀.

*Andrena radiatula* Cockerell, 1902. Canad. Ent. 34: 46. ♀.

*Andrena weedi* Viereck, 1907. Ent. News 18: 284, 285. ♀, ♂.

*Andrena (Trachandrena) prunicola* Cockerell, 1913. Ann. and Mag. Nat. Hist. (8) 12: 375. ♀.

*Andrena (Trachandrena) moscovensis* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 13. ♀.

*Andrena (Trachandrena) corrugata* Cockerell, 1931. Amer. Mus. Novitates 458: 9. ♀.

Taxonomy: Cockerell, 1931. Amer. Mus. Novitates 458: 17 (key, as *moscovensis*). — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 200-202, figs. 36, table 5 (redescription, synonymy). — LaBerge, 1973. Amer. Ent. Soc., Trans. 99: 249-255, figs. 1, 2, 16-21 (redescription, synonymy).

Biology: LaBerge, 1973. Amer. Ent. Soc., Trans. 99: 255 (floral relationships).

*spiraeana* Robertson. Ont. and Maine to Ga., west to Minn., Nebr. and Kans. Pollen: Polylectic, visits flowers of *Alliaria officinalis*, *Angelica*, *Aruncus*, *Azalea*, *Barbarea vulgare*, *Castanea pumila*, *Ceanothus americanus*, *Cornus*, *Crataegus*, *Cryptotaenia*, *Erigeron philadelphicus*, *Euphorbia commutata*, *Heracleum*, *Hydrangea*, *Melilotus alba*, *Pastinaca sativa*, *Physocarpus opulifolius*, *Ptelea*, *Rhus glabra*, *R. typhina*, *Rosa*, *Spiraea aruncus*, *S. latifolia*, *Sorbaria sorbifolia*, *Viburnum nudum*, *Zizia*.

*Andrena spiraeana* Robertson, 1895. Amer. Ent. Soc., Trans. 22: 120. ♀, ♂.

*Andrena (Trachandrena) montensis* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 191, fig. 35. ♀.

*Andrena (Trachandrena) unica* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 203, fig. 36. ♂.

Taxonomy: Robertson, 1902. Amer. Ent. Soc., Trans. 28: 189, 190. ♀, ♂ (key). — Viereck, 1907. Ent. News 23: 107 (key). — Lanham, 1941. Ent. Soc. Amer., Ann. 34: 704, 707. ♀, ♂ (key). — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 202-203, figs. 35, 38, table 5 (redescription). — LaBerge, 1973. Amer. Ent. Soc., Trans. 99: 338-342, figs. 1, 11, 53-54 (redescription, synonymy).

Biology: LaBerge, 1973. Amer. Ent. Soc., Trans. 99: 342 (floral relationships).

*striatifrons* Cockerell. B. C. and Alta., south to Ariz. and Calif. Pollen: Oligolege of *Salix*, but visits other flowers including *Arctostaphylos*, *Eriogonum*, *Hackelia floribunda*, *Lomatium*, *Prunus*, *Pyrus malus*, *Ranunculus*, *Rubus parviflorus*, *Symphoricarpos*, *Taraxacum officinale*, *Vaccinium*.

*Andrena striatifrons* Cockerell, 1897. Entomologist 30: 308. ♀.

*Trachandrena pernuda* Viereck, 1904. Canad. Ent. 35: 159. ♀.

*Andrena trachandrenoides* Viereck, 1904. Canad. Ent. 36: 190, 195. ♀, ♂.

*Andrena (Trachandrena) marioides* Viereck, 1917. Acad. Nat. Sci. Phila., Proc. 68: 601. ♀.

*Andrena (Trachandrena) politissima* Cockerell, 1918. Ann. and Mag. Nat. Hist. (9) 166. ♀.

*Andrena dolichotricha* Cockerell, 1924. Ent. News 35: 348. ♂.

*Andrena (Trachandrena) brevis* Cockerell, 1931. Amer. Mus. Novitates 458: 8. ♀.

*Andrena (Trachandrena) postnita* Cockerell, 1931. Amer. Mus. Novitates 458: 15. ♀.

Taxonomy: Viereck, 1904. Canad. Ent. 36: 159. ♀ (key). — LaBerge, 1973. Amer. Ent. Soc., Trans. 99: 305-311, figs. 1, 10, 42-43 (redescription, synonymy).

Biology: LaBerge, 1973. Amer. Ent. Soc., Trans. 99: 311 (floral relationships).

*virginiana* Mitchell. P. E. I., Que., and Ont., south to Ga., west to Minn., Ill. and Ark. Pollen: Apparently polylectic, visits flowers of *Ceanothus americanus*, *Cerasus serotina*, *Daucus carota*, *Ilex verticillata*, *Kalmia*, *Melilotus alba*, *Pycnanthemum limifolium*, *Spiraea latifolia*, *Solidago*.

*Trachandrena obscura* Robertson, 1902. Amer. Ent. Soc., Trans. 35: 189. ♀. Preocc.

*Andrena (Trachandrena) virginiana* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 203. ♀.

*Andrena (Biareolina) obscurida* Warncke, 1970. Bayer. Ent., Nachr. 19: 30. N. name.

**Taxonomy:** Viereck, 1907. Ent. News 18: 284. ♀ (key, as *obscura*). —Cockerell, 1929. Ent. Soc. Amer., Ann. 22: 757. ♀ (as *obscura*). —LaBerge, 1973. Amer. Ent. Soc., Trans. 99: 273-277, figs. 1, 6, 28-29 (redescription, synonymy).

**Biology:** LaBerge, 1973. Amer. Ent. Soc., Trans. 99: 277 (floral relationships).

**winnemuccana** LaBerge. Nev., Oreg. Pollen: Unknown, but visits flowers of *Thelypodium laciniatum*.

*Andrena (Trachandrena) winnemuccana* LaBerge, 1973. Amer. Ent. Soc., Trans. 99: 366, fig. 1. ♀.

**zionensis** LaBerge. South. Utah. Pollen: Unknown, but visits flowers of *Amelanchier*, *Salix*.

*Andrena (Trachandrena) zionensis* LaBerge, 1973. Amer. Ent. Soc., Trans. 99: 361, figs. 1, 68-69. ♀, ♂.

### Genus ANDRENA Subgenus TYLANDRENA LaBerge

*Andrena* subg. *Tylandrena* LaBerge, 1964. Nebr. Univ. State Mus., Bul. 4: 312.

Type-species: *Cilissa erythrogaster* Ashmead. Orig. desig.

**Revision:** LaBerge and Bouseman, 1970. Amer. Ent. Soc., Trans. 96: 543-605, 75 figs., 5 maps (N. Amer. spp.).

**coracina** LaBerge and Bouseman. South. Calif. (Kramer Hills).

*Andrena (Tylandrena) coracina* LaBerge and Bouseman, 1970. Amer. Ent. Soc., Trans. 96: 591, figs. 1, 61-65. ♀, ♂.

**erythrogaster** (Ashmead). Que. to B. C., south to N. C., Ga., Ark., Okla., N. Mex. and Utah.

Pollen: Apparently an oligolege of *Salix* including *S. amygdaloides*, *S. bebbiana*, *S. cordata*, *S. humilis*, *S. interior*, *S. longifolia*, *S. nigra*, *S. sericea*, but visits other flowers presumably for nectar including *Amelanchier canadensis*, *Anemone canadensis*, *Antennaria plantaginifolia*, *Aronia*, *Claytonia virginica*, *Crataegus coccinea*, *C. crus-galli*, *Descourainia intermedia*, *Heracleum lanatum*, *Lomatium foeniculaceum*, *Prunus americana*, *P. serotina*, *P. virginiana*, *Pyrus*, *Radicula obtusa*, *Rhamnus lanceolata*, *Rhus aromatica*, *R. canadensis*, *R. trilobata*, *Ribes*, *Rubus*, *Shepherdia argentea*, *Spiraea*, *Taraxacum officinale*, *Viburnum prunifolium*, *Zizia aurea*.

*Cilissa erythrogaster* Ashmead, 1890. Colo. Biol. Assoc., Bul. 1: 6. ♂.

*Andrena perezii* Robertson, 1891. Amer. Ent. Soc., Trans. 18: 51. ♀, ♂.

*Andrena rhodura* Cockerell, 1898. Ent. News 9: 171. ♀.

**Taxonomy:** Robertson, 1902. Amer. Ent. Soc., Trans. 28: 190, 192. ♀, ♂ (key). —Lanham, 1941. Ent. Soc. Amer., Ann. 34: 704, 707. ♀, ♂ (key). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 114-115, figs. 18-19, 21, table 3 (redescription). —LaBerge and Bouseman, 1970. Amer. Ent. Soc., Trans. 96: 550-556, figs. 1-2, 6-10 (redescription).

**Biology:** Rau, 1935. Ent. News 45: 35 (nesting habits, floral relationships).

**fuscipennis** LaBerge and Bouseman. Tex. (Kerrville). Pollen: Unknown, but visits flowers of *Prunus*.

*Andrena (Tylandrena) fuscipennis* LaBerge and Bouseman, 1970. Amer. Ent. Soc., Trans. 96: 564, figs. 1, 21-25. ♀, ♂.

**hallii** Dunning. Nebr. and Kans., west to Wash. and Nev. Pollen: Apparently an oligolege of cruciferous flowers, especially *Stanleya pinnata*, but also visits flowers of *Brassica nigra*, *Malvastrum coccineum*, *Melilotus*, *Opuntia*, *Penstemon*, *Prunus*, *Romneya*, *Sisymbrium linifolium*.

*Andrena Hallii* Dunning, 1898. Canad. Ent. 30: 268. ♀.

*Andrena heterura* Cockerell, 1930. N. Y. Ent. Soc., Jour. 37: 445. ♀.

**Taxonomy:** Viereck, 1904. Canad. Ent. 36: 191. ♀ (key). —Cockerell, 1931. Amer. Mus.

Novitates 458: 10. ♀. —LaBerge and Bouseman, 1970. Amer. Ent. Soc., Trans. 96: 588-591, figs. 1, 4, 56-60 (redescription, synonymy).

**hurdi** Lanham. Calif. Pollen: Unknown, but visits flowers of *Brassica*, *Layia*. *A. waldmerei*

LaBerge and Bouseman is possibly a subspecies or synonym of this species which is perhaps the most elegant N. Amer. species of the genus *Andrena*.

*Andrena hurdi* Lanham, 1949. Pan-Pacific Ent. 25: 33. ♀, ♂.

- Taxonomy: LaBerge and Bouseman, 1970. Amer. Ent. Soc., Trans. 96: 583-584, figs. 1, 46-50 (redescription).
- jessicae* Cockerell. N. Mex., Ariz. Pollen: Unknown, but visits flowers of *Lesquerella gordonii*.  
*Andrena jessicae* Cockerell, 1896. Ann. and Mag. Nat. Hist. (6) 18: 79. ♂.
- Taxonomy: Cockerell, 1898. Denison Univ. Sci. Labs., Bul. 11: 48 (key). — LaBerge and Bouseman, 1970. Amer. Ent. Soc., Trans. 96: 571-574, figs. 1, 3, 31-35 (redescription).
- layiae* Timberlake. Calif.; Mexico (Baja California). Pollen: Unknown, but visits flowers of *Brassica*, *Lasthenia chrysostoma*, *L. minor*, *Layia glandulosa*, *Senecio californicus*.  
*Andrena (Ptilandrena) layiae* Timberlake, 1951. U. S. Natl. Mus., Proc. 101: 381. ♀.
- Taxonomy: LaBerge and Bouseman, 1970. Amer. Ent. Soc., Trans. 96: 594-597, figs. 1, 3, 66-70 (redescription).
- mesillae* Cockerell. Tex. to Ariz. Pollen: Apparently an oligolege of *Lesquerella* including *L. gordonii*, *L. gracilis*, but visits other flowers including *Descourainia sophia*, *Phacelia*, *Physaria*, *Senecio salignus*.  
*Andrena mesillae* Cockerell, 1896. Ann. and Mag. Nat. Hist. (6) 18: 90. ♂.
- Taxonomy: Cockerell, 1898. Denison Univ. Sci. Labs., Bul. 11: 49. ♂. (key). — LaBerge and Bouseman, 1970. Amer. Ent. Soc., Trans. 96: 584-588, figs. 1, 4, 51-55 (redescription).
- perplexa* Smith. Occupies a disjunct range; in the east occurs from Ont. and Conn., south to Ga., west to Minn. Iowa, Okla. and Tex.; in the west occurs from Colo. and Mont., west to B. C., Wash., Oreg. and north. Calif. (Shasta County). Pollen: Apparently polylectic, visits flowers of *Acer*, *Amelanchier*, *Aronia*, *Aruncus*, *Barbarea*, *Brassica*, *Crataegus*, *Crepis runcinata*, *Euonymus japonica*, *Fragaria virginiana*, *Geranium*, *Heracleum*, *Lomatium dissectum*, *Malus*, *Melilotus*, *Prunus americana*, *P. demissa*, *P. pennsylvanica*, *P. virginiana*, *Ptelea*, *Pyraecantha*, *Pyrus*, *Rhamnus*, *Rhododendron*, *Rubus deliciosus*, *Salix*, *Senecio*, *Spiraea*, *Stellaria pubera*, *Stenophragma thaliana*, *Taraxacum officinale*, *Viburnum*.  
*Andrena perplexa* Smith, 1853. Cat. Hym. Brit. Mus. v. 1, p. 148. ♀.  
*Andrena belfragei* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 256. ♀.  
*Andrena brauniventris* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 258. ♂.  
*Andrena viburnella* Graenicher, 1903. Canad. Ent. 35: 165. ♀, ♂.
- Taxonomy: Morice and Cockerell, 1901. Canad. Ent. 33: 150 (type). — Viereck, 1904. Canad. Ent. 36: 189, 194. ♀, ♂ (key, as *viburnella*). — Cockerell, 1906. Psyche 13: 10 (type). — Viereck, 1907. Ent. News 18: 365 (as *viburnella*). — Lanham, 1941. Ent. Soc. Amer., Ann. 34: 705, 708. ♀, ♂ (as *viburnella*). — Michener, 1947. Amer. Midland Nat. 38: 445. ♀, ♂ (as *viburnella*). — Lanham, 1949. Ent. News 60: 67 (as *belfragei*). — Mitchell, 1958. In Krombein, U. S. Dept. Agr., Agr. Monog 2, Suppl. 1: 215 (synonymy). — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 116-117, figs. 18-19, 21, table 3 (redescription). — Stephen, 1966. Kans. Ent. Soc., Jour. 39: 51-53, fig. 1 (larva, pupa, as *viburnella*). — LaBerge and Bouseman, 1970. Amer. Ent. Soc., Trans. 96: 559-564, figs. 1, 3, 16-20 (redescription, synonymy).
- Biology: Parker and Boving, 1924. U. S. Natl. Mus., Proc. 64: 1 (nesting habits). — Stephen, 1966. Kans. Ent. Soc., Jour. 39: 42-51, 2 figs. (nest architecture, life history, as *viburnella*).
- subaustralis* Cockerell. B. C. to Calif., east to Idaho, Utah and east. N. Mex. Pollen: Oligolege of *Salix* including *S. gooddingii*, *S. hindsiana*, *S. laevigata*, *S. lasiolepis*, *S. nigra*, but visits other flowers for nectar including *Baccharis viminea*, *Capsella bursa-pastoris*, *Descourainia sophia*, *Hackelia floribunda*, *Malus*, *Prunus americanus*, *Pyrus*, *Ribes aureum*, *R. inerme*, *Senecio salignus*, *Sisymbrium irio*, *Tamarix*, *Taraxacum officinale*.  
 Predator: *Philaethus solivagus* Say.  
*Andrena subaustralis* Cockerell, 1898. Canad. Ent. 30: 146. ♀, ♂.  
*Andrena viridinitens* Cockerell, 1936. Pan-Pacific Ent. 12: 152. ♀.
- Taxonomy: LaBerge and Bouseman, 1970. Amer. Ent. Soc., Trans. 96: 556-559, figs. 1, 2, 11-15 (redescription, synonymy).

**sublayiae** LaBerge and Bouseman. Cent. Calif. Pollen: Unknown, but visits flowers of *Hemizonia*, *Layia*.

*Andrena* (*Tylandrena*) **sublayiae** LaBerge and Bouseman, 1970. Amer. Ent. Soc., Trans. 96: 597, figs. 1, 3, 71-75. ♀, ♂.

**subtilis** Smith. B. C. to Calif., east to Mont., Wyo. and Colo. Pollen: Polylectic, visits flowers of *Acer macrophylla*, *Baccharis viminea*, *Brassica campestris*, *Calandrinia caulescens*, *Caragana*, *Conium maculatum*, *Crepis*, *Gilia*, *Grossularia*, *Hackelia floribunda*, *Lasthenia*, *Limnanthes douglasii* var. *douglasii*, *Lomatium dissectum*, *Prunus demissa*, *P. subcordata*, *Purshia tridentata*, *Pyracantha*, *Pyrus*, *Ranunculus californicus*, *Rosa*, *Salix lasiolepis*, *Senecio*, *Spiraea*, *Tamarix gallica*, *Taraxacum*.

*Andrena subtilis* Smith, 1879. Descr. New Species Hym. Brit. Mus., p. 55. ♀.

*Andrena seminigra* Viereck, 1904. Canad. Ent. 36: 190. ♀.

*Andrena semicyanea* Cockerell, 1924. Pan-Pacific Ent. 1: 58. ♀.

Taxonomy: Morice and Cockerell, 1901. Canad. Ent. 33: 155 (type). —Cockerell, 1906. Psyche 13: 6 (type). —LaBerge and Bouseman, 1970. Amer. Ent. Soc., Trans. 96: 574-580, figs. 1, 5, 36-40 (redescription, synonymy).

Biology: Linsley and MacSwain, 1959. Calif. Univ. Pubs. Ent. 16: 19 (floral relationships).

**waldmerei** LaBerge and Bouseman. South. Calif. Pollen: Unknown, but visits flowers of *Allium haematochiton*, *Encelia californica*, *Lomatium dasycarpum*, *Rhus trilobata*. Possibly a subspecies or synonym of *A. hurdi* Lanham.

*Andrena* (*Tylandrena*) **waldmerei** LaBerge and Bouseman, 1970. Amer. Ent. Soc., Trans. 96: 580, figs. 1, 41-45. ♀, ♂.

**wilmattae** Cockerell. Pa. to N. C., west to Wyo. and Colo. Pollen: Unknown, but visits flowers of *Amorpha canescens*, *Crataegus*, *Crepis runcinata*, *Erigeron*, *Melilotus alba*, *M. officinale*, *Prunus angustifolia*, *Spiraea vanhouttei*, *Pastinaca sativa*, *Viburnum lentago*.

*Andrena Wilmattae* Cockerell, 1906. Ann. and Mag. Nat. Hist. (7) 17: 224. ♀.

*Andrena subaustraliformis* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 28. ♂.

*Andrena beutenmuelleri* Viereck, 1916. Amer. Mus. Nat. Hist., Bul. 35: 729. ♀.

*Andrena* (*Trachandrena*) **acra** Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 111, figs. 18, 19, 21. ♂.

Taxonomy: LaBerge and Bouseman, 1970. Amer. Ent. Soc., Trans. 96: 567-571, figs. 1, 4, 26-30 (redescription, synonymy).

#### Genus ANDRENA Subgenus XIPHANDRENA LaBerge

*Andrena* subg. *Xiphandrena* LaBerge, 1971. Amer. Ent. Soc., Trans. 97: 504.

Type-species: *Andrena* (*Trachandrena*) **mendica** Mitchell. Monotypic and orig. desig.

Revision: LaBerge, 1971. Amer. Ent. Soc., Trans. 97: 504-507, figs. 1, 4, 54-58.

**mendica** Mitchell. Ill., Ohio, Tenn., Va., N. C., Ga. Pollen: Unknown, but visits flowers of *Arnica aruncus*, *Ceanothus* including *C. americanus*.

*Andrena* (*Trachandrena*) **mendica** Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 189, figs. 35-37, 40. ♀, ♂.

#### Genus ANDRENA Subgenus UNASSIGNED

Although some of these species have been assigned and even reassigned to some of the subgenera in *Andrena*, their correct assignments must await further studies of the genus.

**agricolarum** Viereck and Cockerell. Colo.

*Andrena agricolarum* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 29. ♂.

**albuginosa** (Viereck). Oreg.

*Pterandrena albuginosa* Viereck, 1904. Canad. Ent. 36: 227, 228. ♀.

**angustella angustella** Cockerell. Calif.

*Andrena angustella* Cockerell, 1936. Pan-Pacific Ent. 12: 136. ♂.

**angustella quercina** Cockerell. Calif. (Live Oak Canyon, Redlands). Pollen: Unknown, but visits flowers of *Ceanothus*, *Salix*.

*Andrena angustella quercina* Cockerell, 1939. Ann. and Mag. Nat. Hist. (11) 3: 183. ♂.

**angustifovea** Viereck. B. C. to Oreg.

*Andrena angustifovea* Viereck, 1904. Canad. Ent. 36: 194. ♂.

**atala** Viereck. N. Mex.

*Andrena atala* Viereck, 1903. Amer. Ent. Soc., Trans. 23: 54. ♀.

Taxonomy: Cockerell, 1906. Amer. Mus. Nat. Hist., Bul. 22: 430. ♀, ♂.

**azygos** Viereck. N. Mex.

*Andrena (Andrena) azygos* Viereck, 1917. Acad. Nat. Sci. Phila., Proc. 68: 550. ♂.

**banksi** Malloch. N. J. to Fla., west to Tex. Pollen: Unknown, but visits flowers of *Prunus angustifolia*.

*Andrena banksi* Malloch, 1917. Brooklyn Ent. Soc., Bul. 12: 89. ♂, ♀.

Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 254-255, figs. 51, 54, 56-57, table 7 (redescription).

**caeruleonitens** Viereck. Calif.

*Andrena caeruleonitens* Viereck, 1926. Pomona Jour. Ent. Zool. 18: 1. ♂.

**casadae** Cockerell. N. Mex., Colo.

*Andrena casadae* Cockerell, 1896 Ann. and Mag. Nat. Hist. (6) 18: 83. ♂.

Taxonomy: Cockerell, 1898. Denison Univ. Sci. Labs., Bul. 11: 48. ♂ (key).

**cerebrata** Mitchell. N. C., Ark. Pollen: Unknown, but visits flowers of *Malus*, *Philadelphus*, *Raphanus sativa*, *Spiraea*.

*Andrena cerebrata* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 255, figs. 51, 56, 57. ♂.

Taxonomy: Chandler, 1966. Pan-Pacific Ent. 42: 89-90. ♀.

**cragini** Cockerell. Kans.

*Andrena cragini* Cockerell, 1899. Ent. News 10: 254. ♂.

**dallasiana** Cockerell. Tex.

*Andrena dallasiana* Cockerell, 1910. Ann. and Mag. Nat. Hist. (8) 5: 262.

**didelta** Viereck. N. Mex.

*Andrena delta* Viereck, 1903. Amer. Ent. Soc., Trans. 29: 55. ♀. Preocc.

*Andrena didelta* Viereck, 1908. Ent. News 19: 42. N. name.

**dimorpha** Mitchell. N. J., N. C., Fla.

*Andrena (Pterandrena) dimorpha* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 143, figs. 24-26, 28. ♀, ♂.

Taxonomy: LaBerge, 1967. Nebr. Univ. State Mus., Bul. 7: 294 (subgeneric status).

**dolomellea** Lanham. Tex. Pollen: Unknown, but visits flowers of *Crataegus*.

*Andrena dolomellea* Lanham, 1949. Ent. News 60: 65. ♀, ♂.

**dreisbachi** Mitchell. Mich.

*Andrena (Gonandrena) dreisbachi* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 230. ♀.

Taxonomy: Knerer and Atwood, 1963. Canad. Ent. 95: 586, figs. 6, 8. ♂.

**elongatula** Viereck. Calif.

*Andrena (Andrena) elongatula* Viereck, 1917. Amer. Ent. Soc., Trans. 43: 378. ♂.

**enceliarum** Cockerell. Ariz. Pollen: Unknown, but visits flowers of *Encelia farinosa*.

*Andrena enceliarum* Cockerell, 1937. Amer. Mus. Novitates 948: 13. ♂.

**enocki** (Cockerell). Calif.

*Parandrena enocki* Cockerell, 1898. Amer. Ent. Soc., Trans. 25: 189. ♂.

**hirsutula** Cockerell. N. W. T. (Hay River).

*Andrena hirsutula* Cockerell, 1936. Canad. Ent. 68: 282. ♀.

**inclinata** Viereck. Calif.

*Andrena (Andrena) inclinata* Viereck, 1916. Acad. Nat. Sci. Phila., Proc. 68: 559. ♀.



**interrogationis** Viereck and Cockerell. Colo.

*Andrena interrogationis* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 35. ♂.

**jennei** Viereck. Wash.

*Andrena (Andrena) jennei* Viereck, 1917. Acad. Nat. Sci. Phila., Proc. 68: 561. ♂.

**lauracea** Robertson. Ill. Pollen: Unknown, but visits flowers of *Sassafras variifolium*.

*Andrena lauracea* Robertson, 1897. Acad. Sci. St. Louis, Trans. 7: 331. ♀.

Taxonomy: Robertson, 1902. Amer. Ent. Soc., Trans. 28: 194. ♀. — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 148 (redescription).

**littlefieldi** Viereck. Colo.

*Andrena (Andrena) littlefieldi* Viereck, 1916. Acad. Nat. Sci. Phila., Proc. 68: 563. ♂.

**mellitarsis** Viereck. Nev.

*Andrena (Andrena) mellitarsis* Viereck, 1917. Amer. Ent. Soc., Trans. 43: 384. ♂.

**microsoma** Viereck. Pacific Northwest.

*Andrena microsoma* Viereck, 1904. Canad. Ent. 36: 194. ♂.

**monilicornis** Cockerell. N. Mex.

*Andrena monilicornis* Cockerell, 1896. Canad. Ent. 28: 181. ♂.

Taxonomy: Cockerell, 1898. Denison Univ. Sci. Labs., Bul. 11: 48. ♂ (key).

**moquiorum** Viereck and Cockerell. Ariz.

*Andrena moquiorum* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 21. ♂.

**mustelicolor** Viereck. Idaho, Wash. to Calif.

*Andrena mustelicolor* Viereck, 1904. Canad. Ent. 35: 189, 195. ♀, ♂.

**navajorum** Viereck and Cockerell. N. Mex.

*Andrena navajorum* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 29. ♂.

**neurona** Viereck. B. C., Wash.

*Andrena neurona* Viereck, 1904. Canad. Ent. 36: 191. ♀.

**nigerrima** Casad. N. Mex.

*Andrena nigerrima* Casad, 1896. Ann. and Mag. Nat. Hist. (6) 18: 83. ♀.

Taxonomy: Linsley, 1938. Calif. Acad. Sci., Proc. (4) 23: 265, 272. ♀ (key).

**nothoscordi** Robertson. Ill. (Carlinville). Pollen: Unknown, but visits flowers of *Nothoscordum bivalve*.

*Andrena nothoscordi* Robertson, 1897. Acad. Sci. St. Louis, Trans. 7: 331. ♀.

Taxonomy: Robertson, 1902. Amer. Ent. Soc., Trans. 28: 191. ♀ (key). — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 165 (redescription of type). — Ribble, 1968. Nebr. Univ. State Mus., Bul. 8: 333 (subgeneric position).

**nubilifascia** Viereck. Calif.

*Andrena (Ptilandrena) nubilifascia* Viereck, 1916. Acad. Nat. Sci. Phila., Proc. 68: 597. ♀.

**obscuripostica** Viereck. Nev.

*Andrena obscuripostica* Viereck, 1916. Acad. Nat. Sci. Phila., Proc. 68: 568. ♀.

**occidentalis** Cockerell. N. Mex.

*Andrena platyparia occidentalis* Cockerell, 1896. Ann. and Mag. Nat. Hist. (6) 18: 87. ♂.

**oniscicolor** (Viereck). Oreg.

*Pterandrena oniscicolor* Viereck, 1904. Canad. Ent. 36: 227, 228. ♀.

**paduocorum** Viereck and Cockerell. Colo.

*Andrena paduocorum* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 38. ♂.

**pediculihirta** Viereck. Calif.

*Andrena (Ptilandrena) pediculihirta* Viereck, 1916. Acad. Nat. Sci. Phila., Proc. 68: 598. ♀.

**perindotata** Viereck. Wash.

*Andrena indotata* Viereck, 1904. Canad. Ent. 36: 190. ♀. Preocc.

*Andrena perindotata* Viereck, 1908. Ent. News 19: 42. N. name.

**pineti** Cockerell. Wyo.

*Andrena nigerrima pineti* Cockerell, 1931. Amer. Mus. Novitates 458: 13. ♀.

- plumiscopa** Timberlake. South. Calif. Pollen: Unknown, but visits flowers of *Cryptantha intermedia*, *Platystemon californicus*.  
*Andrena (Pterandrena) plumiscopa* Timberlake, 1951. U. S. Natl. Mus., Proc. 101: 376. ♀, ♂.
- Taxonomy: LaBerge, 1967. Nebr. Univ. State Mus., Bul. 7: 294 (subgeneric position).
- polygoni** Viereck and Cockerell. Colo.  
*Andrena polygoni* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 18. ♂.
- potentillarum** Viereck. Alta. to Colo. Pollen: Unknown, but visits flowers of *Potentilla*.  
*Andrena (Andrena) potentillarum* Viereck, 1924. Canad. Ent. 56: 79. ♀.
- pulverea** Viereck. Calif.  
*Andrena (Andrena) pulverea* Viereck, 1916. Acad. Nat. Sci. Phila., Proc. 68: 569. ♀.
- purpurina** Viereck and Cockerell. Colo.  
*Andrena purpurina* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 16. ♀.
- robertsonii** Dalla Torre. Colo. and Minn. to N. S., south to Ark. and Ga. Pollen: Unknown, but visits flowers of *Apocynum*, *Aronia*, *Aruncus*, *Brassica*, *Ceanothus*, *Cryptotaenia*, *Pastinaca*, *Ptelea*, *Pyracantha*, *Rhus*, *Rubus*, *Taenidia*, *Viburnum*. Predator: *Philanthus albopilosus* Cress.  
*Andrena serotina* Robertson, 1893. Amer. Ent. Soc., Trans. 20: 148. ♀ (♂ misdet.). Preocc.  
*Anthrena robertsonii* Dalla Torre, 1896. Cat. Hym., v. 10, p. 149. N. name.
- Taxonomy: Robertson, 1902. Amer. Ent. Soc., Trans. 28: 193. ♀, ♂ (key). —Atwood, 1934. Canad. Jour. Res. 10: 208, 209. ♀, ♂ (key). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 237-238, figs. 46-47, 49, table 6 (redescription).
- Biology: Evans, 1975. Ent. Soc. Amer., Ann. 68: 891 (predator).
- rufjugata** Cockerell. Wyo.  
*Andrena rufjugata* Cockerell, 1931. Amer. Mus. Novitates 458: 17. ♀.
- sancta** Viereck. Calif.  
*Andrena (Andrena) sancta* Viereck, 1916. Acad. Nat. Sci. Phila., Proc. 68: 571. ♀.
- scotoptera** Cockerell. Tex.  
*Andrena scotoptera* Cockerell, 1934. Amer. Mus. Novitates 732: 1. ♀.
- stenosoma** Viereck. Nev.  
*Andrena (Andrena) stenosoma* Viereck, 1925. Amer. Ent. Soc., Trans. 51: 135. ♂.
- stictigastrea** Viereck. Calif.  
*Andrena (Andrena) stictigastrea* Viereck, 1917. Acad. Nat. Sci. Phila., Proc. 68: 579. ♀.
- Taxonomy: Linsley and MacSwain, 1961. Pan-Pacific Ent. 37: 129 (subgeneric position).
- subarctica** Cockerell. Alta. (Hay River).  
*Andrena subarctica* Cockerell, 1936. Canad. Ent. 68: 282. ♀.
- tetonorum** Viereck and Cockerell. Nebr.  
*Andrena tetonorum* Viereck and Cockerell, 1914. U. S. Natl. Mus., Proc. 48: 24. ♂.
- trivialis** Viereck. Calif.  
*Andrena (Andrena) trivialis* Viereck, 1917. Amer. Ent. Soc., Trans. 43: 388. ♀.
- variantia** Linsley. B. C.  
*Andrena (Andrena) varia* Viereck, 1924. Canad. Ent. 56: 81. ♀. Preocc.  
*Andrena variantia* Linsley, 1951. U. S. Dept. Agr., Agr. Monog. 2: 1084. N. name.
- vicinoides** Viereck. B. C., Wash.  
*Andrena vicina* Viereck, 1904. Canad. Ent. 36: 191. ♀.

## NOMINA NUDA IN ANDRENA FABRICIUS

- Andrena alienoides* (Viereck) Smith, 1910. Ins. New Jersey, p. 690.  
*Andrena delawarearum* (Viereck). Smith, 1910. Ins. New Jersey, p. 690.  
*Andrena sparsipilosa* Pierce, 1908. U. S. Natl. Mus., Bul. 66: 108.  
*Andrena tuberculata* (Ashmead) Smith, 1910. Ins. New Jersey, p. 690.

## Genus MEGANDRENA Cockerell

## Genus MEGANDRENA Subgenus MEGANDRENA Cockerell

*Andrena* subg. *Megandrena* Cockerell, 1927. Pan-Pacific Ent. 4: 42.

Type-species: *Andrena* (*Megandrena*) *enceliae* Cockerell. Monotypic.

*enceliae* (Cockerell). Ariz., south. Calif., deserts. Pollen: Oligolectic on flowers of *Larrea tridentata*, but visits other flowers for nectar including *Argemone platyceros*, *Aster*, *Cirsium*, *Encelia californica*, *E. farinosa*, *Eschscholzia darwinensis*, *Geraea canescens*, *Ferrocactus ancanthodes*, *Opuntia basilaris*, *O. echinocarpa*.

*Andrena* (*Megandrena*) *enceliae* Cockerell, 1927. Pan-Pacific Ent. 4: 43. ♀.

Biology: Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 23-24, table 14 (floral relationships, sleep).

## Genus MEGANDRENA Subgenus ERYTHRANDRENA Zavortink

*Megandrena* subg. *Erythrandra* Zavortink, 1972. Ent. Soc. Wash., Proc. 74: 61.

Type-species: *Megandrena* (*Erythrandra*) *mentzeliae* Zavortink. Monotypic and orig. desig.

*mentzeliae* Zavortink. Nev. (Spring Mts., northwest of Las Vegas). Pollen: Oligolectic on flowers of *Mentzelia tricusps*.

*Megandrena* (*Erythrandra*) *mentzeliae* Zavortink, 1972. Ent. Soc. Wash., Proc. 74: 64, figs. 1-3. ♀, ♂.

Biology: Zavortink, 1972. Ent. Soc. Wash., Proc. 74: 69-75, figs. 2-3 (floral relationships, mating, sleep).

## Genus ANCYLANDRENA Cockerell

*Andrena* subg. *Ancylandrena* Cockerell, 1930. Pan-Pacific Ent. 7: 5.

Type-species: *Andrena* (*Ancylandrena*) *heterodoxa* Cockerell. Monotypic.

Revision: Zavortink, 1974. Calif. Acad. Sci., Occas. Papers, 109: 1-36, 6 figs. (N. Amer. spp.).

*atoposoma* (Cockerell). South. Calif.; Mexico (Baja California and Sonora). Pollen: Apparently collects pollen from the flowers of the leguminous genera *Lotus* and *Lupinus* including *Lotus glaber*, *L. scoparius*, *Lupinus formosus*, *L. hallii*, *L. paynei*, but visits these and other flowers for nectar including *Calochortus splendens*, *Ceanothus*, *Convolvulus*, *Cryptantha intermedia*, *Eriodictyon trichocalyx*, *Eriogonum fasciculatum*, *Gilia virgata*, *Penstemon*, *Phacelia ramosissima*, *Sphaeralcea ambigua*.

*Andrena* (*Ancylandrena*) *heterodoxa* Cockerell, 1930. Pan-Pacific Ent. 7: 6. ♂, ♀. Preocc.

*Andrena atoposoma* Cockerell, 1934. Pan-Pacific Ent. 10: 82. N. name.

*koebeleii* (Timberlake). Southeast. Calif. and south. Nev. Pollen: Possibly oligolectic on flowers of *Dalea* including *D. fremontii*, but visits other flowers presumably for nectar including *Echinocactus*, *Oenothera refracta*, *Stanleya pinnata*.

*Megandrena* (*Ancylandrena*) *koebeleii* Timberlake, 1951. U. S. Natl. Mus., Proc. 101: 413. ♂.

Biology: Zavortink, 1974. Calif. Acad. Sci., Occas. Papers, 109: 28 (matinal behavior).

*larreae* Timberlake. N. Mex. (Lordsburg), west to south. Calif. and south. Nev., deserts.

Parasite: *Hexepeolus rhodogyne* Linsley and Michener? Pollen: Oligolectic on flowers of *Larrea tridentata*, but visits these flowers and others for nectar including *Dalea greggii*, *Prosopis juliflora*.

*Megandrena* (*Ancylandrena*) *larreae* Timberlake, 1951. U. S. Natl. Mus., Proc. 101: 411. ♀, ♂.

Biology: Zavortink, 1974. Calif. Acad. Sci., Occas. Papers 109: 23 (floral relationships).

—Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 22-23, fig. 4, tables 2, 9, 11, 12-14 (floral relationships, parasite).

*timberlakei* Zavortink. Ariz. to south. Calif. and south. Nev. Pollen: Apparently polylectic, visits flowers of *Dalea fremontii*, *Eriodictyon trichocalyx*, *Hyptis emoryi*, *Larrea*

*tridentata*, *Lepidium fremontii*, *Malacothrix*, *Mentzelia involucreta*, *M. tricuspis*, *Phacelia*, *Sphaeralcea ambigua*, *Verbesina*.  
*Ancylandrena timberlakei* Zavortink, 1974. Calif. Acad. Sci., Occas. Papers 109: 16, figs. 1, 4. ♂, ♀.

Biology: Zavortink, 1974. Calif. Acad. Sci., Occas. Papers 109: 19 (floral relationships).

#### SUBFAMILY PANURGINAE

Taxonomy: Rozen, 1966. Amer. Mus. Novitates 2259: 1-22, 54 figs. (larvae). —Yager and Rozen, 1966. Amer. Mus. Novitates 2265: 6-13, figs. 7-18 (pupae). —Rozen, 1970. Amer. Mus. Novitates 2416: 1-16, 19 figs. (immature stages).

Biology: Rozen, 1967. Amer. Mus. Novitates 2297: 1-44, 18 figs. (review of N. Amer. spp.).

#### Genus PROTANDRENA Cockerell

*Protandrena* Cockerell, 1896. Ann. and Mag. Nat. Hist. (6) 18: 91.

Type-species: *Andrena maurula* Cockerell. Desig. by Sandhouse, 1943.

*Austrandrena* Timberlake, 1906. Psyche 13: 37.

Type-species: *Andrena modesta* Smith. Monotypic and orig. desig.

*Protoandrena* Cresson, 1928. Amer. Ent. Soc., Mem. 5: 58. Emend.

Revision: Timberlake, 1976. Amer. Ent. Soc., Trans. 102: 133-227, 93 figs. (N. Amer. spp.).

Taxonomy: Cockerell, 1896. Ann. and Mag. Nat. Hist. (6) 18: 92 (tax. characters). —Cockerell, 1896. Canad. Ent. 28: 184 (tax. characters). —Timberlake, 1955. Bol. Lab. Zool. Gen. Agr. 33: 398-409 (key to females, as *Psaenythia*). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 286-287, figs. 58, 67-68, table 8 (east. U. S. spp.). —Timberlake, 1973. Calif. Univ. Pubs. Ent. 72: 1 (tax. status).

*amplipennis* Timberlake. Ariz. (10 mi. S.W. of Patagonia). Pollen: Unknown, but visits flowers of *Croton*.

*Protandrena amplipennis* Timberlake, 1976. Amer. Ent. Soc., Trans. 102: 146. ♀.

*bancrofti* Dunning. Ariz., N. Mex., Tex., Kans., Mo., Okla., Nebr., Colo., Wyo., Iowa, N. Dak., Ind., Ill., Wis. Pollen: Unknown, but visits flowers of *Amorpha*, *Asclepias*, *Astragalus*, *Baccharis*, *Eysenhardtia*, *Guardiola*, *Helianthus*, *Heterotheca*, *Lepidium*, *Medicago*, *Melilotus*, *Monarda*, *Petalostemon*, *Psoralea*, *Solanum*, *Symphoricarpos*.

*Protandrena Bancrofti* Dunning, 1897. Canad. Ent. 29: 264. ♀.

Taxonomy: Cockerell, 1921. Amer. Mus. Novitates 24: 13. ♀. —Timberlake, 1976. Amer. Ent. Soc., Trans. 102: 150, figs. 4, 5, 6 (geogr. and floral records).

Biology: Chandler, 1962. Kans. Ent. Soc., Jour. 35: 314 (nest).

*bicolor* (Timberlake). Tex. to Ariz.; Mexico (Coahuila, Durango). Pollen: Collects pollen from flowers of the composite genus *Bahia*, but also visits flowers of *Verbesina*.

*Psaenythia bicolor* Timberlake, 1955. Bol. Lab. Zool. Gen. Agr. 33: 401. ♀.

Taxonomy: Rozen, 1970. Amer. Mus. Novitates 2416: 9-13, figs. 9-17 (larva, pupa).

—Timberlake, 1976. Amer. Ent. Soc., Trans. 102: 150-152, figs. 7, 8, 9. ♂.

Biology: Rozen, 1967. Amer. Mus. Novitates 2297: 17-19, fig. 6 (nesting activity, nest architecture, floral relationships). —Rozen, 1970. Amer. Mus. Novitates 2416: 6-7, fig. 2 (nest architecture, nesting habits).

*bishoppi* Crawford. Tex.

*Protandrena bishoppi* Crawford, 1916. Ent. Soc. Wash., Proc. 19: 128. ♀.

Taxonomy: Timberlake, 1976. Amer. Ent. Soc., Trans. 102: 152-153 (notes on type).

*cockerelli* Dunning. N. J., Ind., Ill., Iowa, Mich., Nebr., Mo., Kans., Colo., N. Mex., Tex. Pollen:

Unknown, but visits flowers of *Acerates*, *Amphiachyris*, *Asclepias*, *Cassia*, *Euphorbia corollata*, *Gaillardia*, *Melilotus*, *Monarda*, *Petalostemon*, *Solanum*, *Teucrium*.

*Protandrena Cockerelli* Dunning, 1897. Canad. Ent. 29: 47. ♀.

- Taxonomy:** Cockerell, 1899. Ent. News 10: 3. ♂. —Timberlake, 1955. Bol. Lab. Zool. Gen. Agr. 33: 400 (tax. status). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 287 (tax. characters and status). —Timberlake, 1976. Amer. Ent. Soc., Trans. 102: 156-157 (tax. characters and status).
- cognata** Timberlake. Ariz. (Cochise County).  
*Protandrena cognata* Timberlake, 1976. Amer. Ent. Soc., Trans. 102: 157. ♀.
- duplonotata** (Timberlake). Ariz. (Pinal Co.); Mexico (Sonora). Pollen: Unknown, but visits flowers of *Hymenothrix*.  
*Psaenythia duplonotata* Timberlake, 1955. Bol. Lab. Zool. Gen. Agr. 33: 407. ♀.
- Taxonomy:** Timberlake, 1976. Amer. Ent. Soc., Trans. 102: 159 (geogr. and floral record).
- euphorbiae** (Timberlake). Ariz. (Hope and Picacho Pass); Mexico (Sonora). Pollen: Unknown, but visits flowers of *Euphorbia*, including *E. capitellata*.  
*Psaenythia euphorbiae* Timberlake, 1955. Bol. Lab. Zool. Gen. Agr. 33: 406. ♀.
- Taxonomy:** Timberlake, 1976. Amer. Ent. Soc., Trans. 102: 161-162, figs. 16, 17, 18. ♂.
- heteromorpha** (Cockerell). N. Mex., Ariz. Pollen: Unknown, but visits flowers of *Aplopappus gracilis*, *Gutierrezia microcephala*, *Heterotheca subaxillaris*, *Verbesina encelioides*.  
*Andrena heteromorpha* Cockerell, 1896. Canad. Ent. 28: 180. ♀, ♂.
- Taxonomy:** Timberlake, 1976. Amer. Ent. Soc., Trans. 102: 168-171, figs. 25, 26, 27 (redescription).
- hurdi** Timberlake. N. Mex. (Rodeo and 25 miles east of Steins), Ariz. (Chiricahua and Huachuca Mts.). Pollen: Unknown, but visits flowers of *Asclepias subverticillata*.  
*Protandrena hurdi* Timberlake, 1976. Amer. Ent. Soc., Trans. 102: 171, figs. 28, 29, 30. ♂.
- kansensis** Timberlake. Kans. (Douglas and Greenwood Counties). Pollen: Unknown, but visits flowers of *Amphichyris dracunculoides*.  
*Protandrena kansensis* Timberlake, 1976. Amer. Ent. Soc., Trans. 102: 175, figs. 34, 35, 36. ♀, ♂.
- leucopus** Timberlake. Ariz. (Cochise and Pima Counties).  
*Protandrena leucopus* Timberlake, 1976. Amer. Ent. Soc., Trans. 102: 178, figs. 40, 41, 42. ♂.
- maurula** (Cockerell). Tex.  
*Andrena maurula* Cockerell, 1896. Canad. Ent. 28: 179. ♀.
- mexicanorum** (Cockerell). N. Dak., Nebr. Colo. and Tex., west to Ariz.; Mexico (Chihuahua, Coahuila, Durango and Sonora). Pollen: Unknown, but visits flowers of *Asclepias*, *Kallstroemia grandiflora*, *Solanum*. *Protandrena durangoensis* Timberlake is possibly a subspecies of this.  
*Andrena mexicanorum* Cockerell, 1896. Ann. and Mag. Nat. Hist. (6) 18: 85. ♀  
*Andrena asclepiadis* Cockerell, 1896. Ann. and Mag. Nat. Hist. (6) 18: 86. ♂.
- Taxonomy:** Timberlake, 1955. Bol. Lab. Zool. Gen. Agr. 33: 400 (synonymy, tax. status, flower records). —Timberlake, 1976. Amer. Ent. Soc., Trans. 102: 188-189, figs. 55, 56, 57 (tax. characters and status).
- pectidis** (Timberlake). Ariz., N. Mex.; Mexico (Sonora). Pollen: Unknown, but visits flowers of *Pectis papposa*, *Viguiera annua*.  
*Psaenythia pectidis* Timberlake, 1955. Bol. Lab. Zool. Gen. Agr. 33: 405. ♀.
- Taxonomy:** Timberlake, 1976. Amer. Ent. Soc., Trans. 102: 191-192, figs. 58, 59, 60. ♂.
- sorocula** Timberlake. N. Mex. (7 miles southeast of Rodeo).  
*Protandrena sorocula* Timberlake, 1976. Amer. Ent. Soc., Trans. 102: 205. ♀.
- sphaeralceae** Timberlake. Ariz. (Cochise County). Pollen: Unknown, but visits flowers of *Sphaeralcea*.  
*Protandrena sphaeralceae* Timberlake, 1976. Amer. Ent. Soc., Trans. 102: 207. ♀.
- swenki** Crawford. Nebr.  
*Protandrena swenki* Crawford, 1913. U. S. Natl. Mus., Proc. 45: 241. ♀.
- Taxonomy:** Timberlake, 1976. Amer. Ent. Soc., Trans. 102: 191-192, figs. 58, 59, 60. ♂.

*texana* Timberlake. Tex. (Archer, Gillespie and Throckmorton Counties). Pollen: Unknown, but visits flowers of *Teucrium laciniatum*.

*Protandrena texana* Timberlake, 1976. Amer. Ent. Soc., Trans. 102: 211, figs. 76, 77, 78. ♂.

*tidestromiae* Timberlake. N. Mex., Ariz. Pollen: Collects pollen from flowers of *Tidestromia* including *T. lanuginosa*, but visits other flowers presumably for nectar including *Verbesina*.

*Protandrena tidestromiae* Timberlake, 1976. Amer. Ent. Soc., Trans. 102: 212, figs. 79, 80, 81. ♀, ♂.

*trifoliata* (Cockerell). N. Mex., Ariz. Pollen: Unknown, but visits flowers of *Baccharis glutinosa*, *Euphorbia capitellata*, *Solanum*, *Trifolium*, *Verbesina*.

*Andrena trifoliata* Cockerell, 1896. Canad. Ent. 28: 179. ♀.

Taxonomy: Timberlake, 1976. Amer. Ent. Soc., Trans. 102: 215-217, figs. 82, 83, 84. ♂.

*verbesinae* (Timberlake). West Tex. to Ariz.; Mexico (Coahuila and Durango). Pollen: Unknown, but visits flowers of *Asclepias*, *Baileya*, *Heterotheca*, *Pectis*, *Verbesina encelioides*.

*Psaenythia verbesinae* Timberlake, 1955. Bol. Lab. Zool. Gen. Agr. 33: 402. ♀, ♂.

Taxonomy: Timberlake, 1976. Amer. Ent. Soc., Trans. 102: 222-224, figs. 88, 89, 90 (geogr. and floral records).

### Genus PANURGINUS Nylander

*Panurginus* Nylander, 1848. Notiser Sällskapet Flora Fauna Fenn. 1: 223.

Type-species: *Panurginus niger* Nylander. Monotypic.

*Greeleyella* Cockerell, 1904. Entomologist 37: 235.

Type-species: *Greeleyella beardsleyi* Cockerell. Monotypic and orig. desig.

*Birkmania* Viereck, 1909. Ent. Soc. Wash. Proc. 11: 50.

Type-species: *Panurginus polytrichus* Cockerell. Monotypic and orig. desig.  
(= *Birkmania andrenoides* Viereck).

Revision: Crawford, 1926. Ent. Soc. Wash., Proc. 28: 207-214. — Michener, 1935. Canad. Ent. 67: 275-278 (species with blackfaced males).

Taxonomy: Rozen, 1966. Amer. Mus. Novitates 2259: 5, 10-12, figs. 17-28 (larvae).

*armaticeps* Cockerell. South. Calif. Pollen: Unknown, but visits flowers of *Ceanothus integerrimus*, *Cryptantha intermedia*, *Gilia integrifolia*, *Phacelia davidsonii*, *P. distans*, *Potentilla glandulosa*, *Prunus demissa*, *Rhamnus crocea*, *Salix laevigata*.

*Panurginus armaticeps* Cockerell, 1916. Ann. and Mag. Nat. Hist. (8) 17: 280. "♀" = ♂.

Taxonomy: Michener, 1937. Ann. and Mag. Nat. Hist. (10) 19: 322. ♂, ♀.

*atramontensis* Crawford. Md. to Ga., Miss. Pollen: Unknown, but visits flowers of *Polycodium*.

*Panurginus atramontensis* Crawford, 1926. Ent. Soc. Wash., Proc. 28: 210. ♂, ♀.

Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 259-260, figs. 59-61, table 8 (redescription).

*atriceps* (Cresson). Idaho, Wash., Oreg., Calif. Pollen: Collects pollen from flowers of *Douglasia bella* or *D. cuspidata*, but also visits flowers of *Ceanothus dentatus*, *C. integerrimus*, *Cryptantha intermedia*, *Lasthenia chrysostoma*, *Montia perfoliata*, *Nemophila maculata*, *N. pulchella*, *Ranunculus*, *Rhamnus crocea*, *Rhus diversiloba*, *Tamarix gallica*. Predator: *Philanthus pulcher* Dalla Torre.

*Callopsis atriceps* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 67. ♂.

Taxonomy: Cockerell, 1898. Amer. Ent. Soc., Trans. 25: 194. ♀. — Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 198. ♂, ♀. — Rust, 1976. Pan-Pacific Ent. 52: 165, figs. 3, 10-16 (larva).

Biology: Rust, 1976. Pan-Pacific Ent. 52: 161-166, figs. 2-9 (nest site, nest architecture, cell provisions, adult and immature habits).

*beardsleyi* (Cockerell). N. Dak., Nebr., Colo. Pollen: Unknown, but visits flowers of *Malvastrum*.

*Greeleyella beardsleyi* Cockerell, 1904. Entomologist 37: 236. ♀.

*Panurginus malvastri* Swenk and Cockerell, 1907. Ent. News 18: 179. ♂, ♀.

Taxonomy: Cockerell, 1906. Canad. Ent. 38: 164. ♂.

**bilobatus** Michener. South. Calif. Pollen: Unknown, but visits flowers of *Astragalus*, *Cryptantha intermedia*, *Gilia integrifolia*, *Lasthenia gracilis*, *Phacelia distans*, *P. hispida*, *Rhamnus crocea*, *R. ilicifolia*, *Salvia columbariae*, *Salix laevigata*, *Sisymbrium irio*.

*Panurginus bilobatus* Michener, 1937. Ann. and Mag. Nat. Hist. (10) 19: 322. ♂, ♀.

**ceanothi** Michener. South. Calif. Pollen: Unknown, but visits flowers of *Ceanothus*.

*Panurginus ceanothi* Michener, 1935. Pan-Pacific Ent. 11: 180. ♂.

**cressoniellus** Cockerell. Colo., N. Mex. Predator: *Philanthus pulcher* Dalla Torre.

*Calliopsis clypeata* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 67. ♂. Preocc.

*Panurginus cressoniellus* Cockerell, 1898. Canad. Ent. 30: 29. N. name.

*Panurginus cressoniellus calochorti* Cockerell, 1906. Ann. and Mag. Nat. Hist. (7) 17: 222. ♀.

?*Panurginus verus* Cockerell, 1901. Psyche 9: 163. ♀.

Taxonomy: Cockerell, 1897. Acad. Nat. Sci. Phila., Proc. 49: 350. ♂, ♀. — Viereck, 1903. Amer. Ent. Soc., Trans. 29: 49. ♂. — Cockerell, 1912. Ent. News 23: 445 (synonymy).

**emarginatus** Michener. Calif.

*Panurginus emarginatus* Michener, 1935. Pan-Pacific Ent. 11: 179. ♂, ♀.

**gabrielis** Michener. South. Calif.; Mexico (Baja California). Pollen: Unknown, but visits flowers of *Arctostaphylos glauca*, *Ceanothus crassifolius*, *C. greggii*, *C. leucodermis*, *C. verrucosus*, *Rhamnus californica*, *R. crocea*.

*Panurginus gabrielis* Michener, 1935. Canad. Ent. 67: 276. ♂.

Taxonomy: Michener, 1937. Ann. and Mag. Nat. Hist. (10) 19: 321 (tax. characters).

**gracilis** Michener. Calif.; Mexico (Baja California). Pollen: Unknown, but visits flowers of *Arctostaphylos pungens*, *Baccharis*, *Ceanothus crassifolius*, *C. verrucosus*, *Lasthenia chrysostoma*, *Rhamnus crocea*, *Salix lasiolepis*, *Salvia mellifera*.

*Panurginus gracilis* Michener, 1935. Canad. Ent. 67: 276. ♂, ♀.

**ineptus** Cockerell. Colo., Wash., Oreg., Utah.

*Panurginus ineptus* Cockerell, 1922. Amer. Mus. Novitates 36: 8. ♀.

*Panurginus bakeri* Crawford, 1926. Ent. Soc. Wash., Proc. 28: 213. ♂. Preocc.

*Panurginus rohweri* Crawford, 1932. Ent. Soc. Wash., Proc. 34: 78. N. name.

Taxonomy: Timberlake, 1971. Pan-Pacific Ent. 47: 148 (tax. status, synonymy).

**maritimus** Michener. Calif.

*Panurginus maritimus* Michener, 1935. Pan-Pacific Ent. 11: 178. ♂.

Taxonomy: Michener, 1935. Canad. Ent. 67: 277. ♀.

**melanocephalus** (Cockerell). Calif. Parasite: *Zodion cinereiventre* Van Duzee, *Z. nigrifrons* Krober. Pollen: Collects pollen of *Ranunculus californicus*, but visits these and other flowers for nectar.

*Panurgus melanocephalus* Cockerell, 1926. Pan-Pacific Ent. 3: 80. ♂, ♀.

*Panurginus morrisoni* Crawford, 1926. Ent. Soc. Wash., Proc. 28: 209. ♂.

Taxonomy: Michener, 1953. Kans. Univ. Sci. Bul. 35: 1036, figs. 86-88 (larva). — Rozen, 1966. Amer. Mus. Novitates 2259: 12, figs. 21-23 (larva).

Biology: MacSwain and Bohart, 1947. Pan-Pacific Ent. 23: 30 (parasite). — Linsley and MacSwain, 1959. Calif. Univ. Pubs. Ent. 16: 20-21, 28 pl. 6 (nest, life history, mating, sex ratio, floral relationships, parasite).

**nigrellus** Crawford. Calif. Pollen: Unknown, but visits flowers of *Arctostaphylos*, *Baccharis glutinosa*, *Cryptantha intermedia*, *Lasthenia chrysostoma*, *Nemophila pulchella*, *Ranunculus californicus*, *Salix lasiolepis*, *Tamarix gallica*.

*Panurginus nigrellus* Crawford, 1926. Ent. Soc. Wash., Proc. 28: 210. ♂.

Taxonomy: Michener, 1935. Pan-Pacific Ent. 11: 180. ♀.

**nigrihirtus** Michener. Calif.

*Panurginus nigrihirtus* Michener, 1935. Pan-Pacific Ent. 11: 179. ♂, ♀.

**occidentalis** (Crawford). Calif. Pollen: Collects pollen from flowers of *Limnanthes douglasii*.  
*Greeleyella occidentalis* Crawford, 1916. Insecutor Inscitiae Menstruus 4: 105. ♂, ♀.

Biology: Rust, 1976. Pan-Pacific Ent. 52: 159, 165-166, fig. 1 (mating behavior, pollen and nectar source).

**polytrichus** Cockerell. Miss., La., Tex.

*Panurginus polytrichus* Cockerell, 1909. Ann. and Mag. Nat. Hist. (8) 4: 28. ♂.

*Birkmania andrenoides* Viereck, 1909. Ent. Soc. Wash., Proc. 11: 50. ♀.

*Greeleyella resinata* Cockerell, 1910. Ann. and Mag. Nat. Hist. (8) 5: 361. ♀.

Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 260-262, figs. 59-61, table 8 (redescription).

**potentillae** (Crawford). N. J., Md., Va., N. C. Pollen: Collects pollen from the flowers of *Potentilla*, but visits these and other flowers for nectar including *Fragaria*, *Ranunculus*.

*Greeleyella potentillae* Crawford, 1916. Insecutor Inscitiae Menstruus 4: 104. ♂, ♀.

Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 262-263, figs. 59-61, table 8 (redescription). —Rozen, 1966. Amer. Mus. Novitates 2259: 10-12, figs. 17-20 (larva).

—Rozen, 1967. Amer. Mus. Novitates 2297: 28-29, figs. 12-13, table 2 (egg, larva).

Biology: Rozen, 1967. Amer. Mus. Novitates 2297: 27-30, tables 1-2 (nest architecture, life history, floral relationship).

### Genus PSEUDOPANURGUS Cockerell

*Pseudopanurgus* Cockerell, 1897. Canad. Ent. 29: 290.

Type-species: *Panurgus aethiops* Cresson. Orig. desig.

*Protandrenopsis* Crawford, 1903. Canad. Ent. 35: 337.

Type-species: *Panurgus aethiops* Cresson. Monotypic and orig. desig.

(=*Protandrenopsis fuscipennis* Crawford).

Revision: Timberlake, 1973. Calif. Univ. Pubs. Ent. 72: 1-58, 4 plates, 56 figs. (N. Amer. spp.).

Taxonomy: Cockerell, 1898. Amer. Ent. Soc., Trans. 25: 195-198. —Cockerell, 1922. Amer. Mus. Novitates 36: 9. —Robertson, 1922. Psyche 29: 164 (Illinois spp.). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 266-270, figs. 62, 65-66, table 8 (eastern U. S. spp.). —Rozen, 1966. Amer. Mus. Novitates 2259: 5, 7-9, figs. 8-16 (larva). —Timberlake, 1967. Amer. Mus. Novitates 2298: 1-10 (Ariz. spp.). —Timberlake, 1975. Calif. Univ. Pubs. Ent. 77: 1, 2 (key, tax. status).

Biology: Rozen, 1967. Amer. Mus. Novitates 2297: 19-27, figs. 1-3, 6-8, tables 1-2 (nest architecture, life history, floral relationships, parasites).

**aethiops** (Cresson). Nebr., Kans., Colo., Tex., N. Mex., Ariz. Pollen: Collects pollen from the flowers of Compositae including *Baileya*, *Encelia*, *Grindelia*, *Helianthus*, *Heterotheca*, *Melampodium*, *Prionopsis*, *Verbesina encelioides*, but visits these and other flowers for nectar including *Asclepias*.

*Panurgus aethiops* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 259. ♀, ♂.

*Protandrenopsis fuscipennis* Crawford, 1903. Canad. Ent. 35: 337. ♀.

Taxonomy: Michener, 1951. In Muesebeck, Krombein and Townes, U. S. Dept. Agr., Agr. Monog. 2: 1098 (synonymy). —Rozen, 1966. Amer. Mus. Novitates 2259: 9 figs. 9-10 (larva). —Timberlake, 1973. Calif. Univ. Pubs. Ent. 72: 8-10 figs. 1-2 (redescription).

Biology: Hicks, 1931. Canad. Ent. 63: 172 (nest). —Rozen, 1967. Amer. Mus. Novitates 2297: 19-27, figs. 1-2, 7, tables 1-2 (nest architecture, life history, floral relationship).

Taxonomy: Timberlake, 1973. Calif. Univ. Pubs. Ent. 72: 10 (pollen sources).

**bradleyi** Timberlake. Tex. (Blanco County).

*Pseudopanurgus bradleyi* Timberlake, 1973. Calif. Univ. Pubs. Ent. 72: 10, figs. 3-4. ♂.

**cazieri cazieri** Timberlake. Ariz. (Cochise County). Another subspecies, *P. c. coahuilensis* Timberlake, occurs in Mexico.

*Pseudopanurgus cazieri cazieri* Timberlake, 1973. Calif. Univ. Pubs. Ent. 72: 13, figs. 7-8.

♀, ♂.



**dicksoni** Timberlake. N. Mex., Ariz.; Mexico (Baja California and Sonora). Pollen: Unknown, but visits flowers of *Aplopappus*, *Argemone intermedia*, *Crotalaria pumila*, *Millieria quinquefolia*, *Pectis papposa*.

*Pseudopanurgus dicksoni* Timberlake, 1967. Amer. Mus. Novitates 2298: 8. ♀, ♂.

Taxonomy: Timberlake, 1973. Calif. Univ. Pubs. Ent. 72: 19, figs. 15-16 (tax. characters, flower record).

**fraterculus fraterculus** (Cockerell). West. Tex., N. Mex.; Mexico (Aguascalientes, Coahuila, Durango and San Luis Potosi). Pollen: Unknown, but visits flowers of *Gutierrezia lucida*, *Tidestromia*.

*Calliopsis fraterculus* Cockerell, 1896. Canad. Ent. 28: 159. ♂, ♀.

Taxonomy: Timberlake, 1973. Calif. Univ. Pubs. Ent. 72: 21-23 (redescription, tax. status).

**fraterculus timberlakei** Cockerell. Colo., N. Mex., Ariz., Calif. (San Diego County); Mexico (Baja California). Parasite: *Holcopasites arizonicus* (Linsley)?, *H. insoletus* (Linsley)?

Pollen: Apparently an oligolege of the Compositae, including *Aplopappus gracilis*, *Baileya multiradiata*, *B. pleniradiata*, *Gutierrezia californica*, *G. microcephala*, *Heliopsis*, *Heterotheca subaxillaris*, *Hymenothrix wislizeni*, *Pectis papposa*, but visits these and other flowers for nectar including *Allionia*, *Eriogonum*.

*Pseudopanurgus timberlakei* Cockerell, 1931. Ent. Soc. Wash., Proc. 33: 201.

Taxonomy: Timberlake, 1973. Calif. Univ. Pubs. Ent. 72: 23-24, figs. 2, 19-20 (redescription, floral and geogr. records).

Biology: Rozen, 1965. N. Y. Ent. Soc., Jour. 73: 88 (parasite). — Rozen, 1967. Amer. Mus. Novitates 2297: 19-27, figs. 1-2, tables 1-2 (nest architecture, life history, pollen source, parasite). — Hurd and Linsley, 1972. Smithsn. Contrib. Zool. 114: 39 (parasites).

**pectidellus** Cockerell. N. Mex., Ariz.; Mexico (Chihuahua). Pollen: Apparently an oligolege of the Compositae, visits flowers of *Baileya*, *Pectis papposa*, *Verbesina*.

*Pseudopanurgus pectidellus* Cockerell, 1904. Ann. and Mag. Nat. Hist. (7) 14: 26.

Taxonomy: Timberlake, 1973. Calif. Univ. Pubs. Ent. 72: 32-34, figs. 33-34 (redescription, geogr. and floral records).

**pectiphilus** (Cockerell). N. Mex., Ariz. Pollen: Apparently an oligolege of the Compositae, visits flowers of *Baileya multiradiata*, *Heterotheca subaxillaris*, *Pectis papposa*, *Tidestromia lanuginosa*.

*Panurginus pectiphilus* Cockerell, 1913. Ann. and Mag. Nat. Hist. (8) 11: 193. ♀.

Taxonomy: Timberlake, 1973. Calif. Univ. Pubs. Ent. 72: 34-35, figs. 35-36 (redescription, geogr. and floral records).

**perarmatus** Timberlake. South. Ariz.; Mexico (Chihuahua and Sonora). Pollen: Apparently an oligolege of the Compositae, visits flowers of *Aplopappus gracilis*, *Heterotheca subaxillaris*, *Verbesina encelioides*, *Zexmenia podoccephala*.

*Pseudopanurgus perarmatus* Timberlake, 1967. Amer. Mus. Novitates 2298: 5. ♀, ♂.

Taxonomy: Timberlake, 1973. Calif. Univ. Pubs. Ent. 72: 35, figs. 37-38 (tax. characters).

**perpunctatus** Timberlake. N. Mex., Ariz. Pollen: Presumably an oligolege of Compositae, visits flowers of *Heterotheca*, *Pectis papposa*.

*Pseudopanurgus perpunctatus* Timberlake, 1973. Calif. Univ. Pubs. Ent. 72: 35, figs. 39-40. ♀, ♂.

**rugosus** (Robertson). Md. to Ga., west to Ill., Nebr., Kans., Tex. Pollen: Apparently an oligolege of the Compositae, especially the Helianthae, visits flowers of *Bidens aristosa*, *Helianthus annuus*, *H. divaricatus*, *H. mollis*, *H. petiolaris*, *H. subaxillaris*, *Heliopsis helianthoides*, *Pontederia cordata*, *Rudbeckia laciniata*, *R. triloba*, *Silphium perfoliatum*, *S. speciosum*, but visits flowers of *Melilotus officinalis* for nectar.

*Calliopsis rugosus* Robertson, 1895. Amer. Ent. Soc., Trans. 22: 121. ♀, ♂.

Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 269-270, figs. 62, 65-66 (redescription). — Timberlake, 1973. Calif. Univ. Pubs. Ent. 72: 38, figs. 41-42 (tax. characters, geogr. and floral records).

**texanus** Timberlake. Tex.; Mexico (Tamaulipas).

*Pseudopanurgus texanus* Timberlake, 1973. Calif. Univ. Pubs. Ent. 72: 40, figs. 45-46. ♀, ♂.

**verticalis** Timberlake. N. Mex., Ariz., south. Calif. (Riverside County); Mexico (Sonora).

Parasite: *Holcospasites insoletus* (Linsley). Pollen: Apparently an oligolege of the Compositae; visits flowers of *Bahia absinthifolia*, *Pectis papposa*, *Verbesina encelioides*, but also visits the flowers of *Kallstroemia grandiflora* presumably for nectar.

*Pseudopanurgus verticalis* Timberlake, 1967. Amer. Mus. Novitates 2298: 2. ♀, ♂.

Taxonomy: Rozen, 1966. Amer. Mus. Novitates 2259: 9, figs. 11-16 (larva, as *Pseudopanurgus* sp. B). —Timberlake, 1973. Calif. Univ. Pubs. Ent. 72: 50, figs. 55-56 (tax. characters).

Biology: Rozen, 1967. Amer. Mus. Novitates 2297: 27 (parasite of *Pseudopanurgus* sp. B).

—Hurd and Linsley, 1972. Smithsn. Contrib. Zool. 114: 39 (parasite).

### Genus ANTHEMURGUS Robertson

*Anthemurgus* Robertson, 1902. Canad. Ent. 34: 321.

Type-species: *Anthemurgus passiflorae* Robertson. Monotypic and orig. desig.

Taxonomy: Timberlake, 1973. Calif. Univ. Pubs. Ent. 72: 1 (tax. status).

**passiflorae** Robertson Ill. to N. C. Pollen: Unknown, but visits flowers of *Passiflora*.

*Anthemurgus passiflorae* Robertson, 1902. Canad. Ent. 34: 321. ♀, ♂.

Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 265-266, figs. 62, 65-66 (redescription).

### Genus HETEROSARUS Robertson

*Heterosarus* Robertson, 1918. Ent. News 29: 91.

Type-species: *Calliopsis parvus* Robertson. Monotypic and orig. desig.

Revision: Timberlake, 1975. Calif. Univ. Pubs. Ent. 77: 1-56, 8 plates, 87 figs. (N. Amer. spp.).

Taxonomy: Timberlake, 1964. Amer. Mus. Novitates 2185: 2-5 (key to spp. in Amer. north of Mexico). —Timberlake, 1973. Calif. Univ. Pubs. Ent. 72: 1, 2 (tax. status).

**arizonicus** (Timberlake). Ariz., N. Mex. Pollen: Unknown, but visits flowers of *Eriogonum*.

*Pseudopanurgus arizonicus* Timberlake, 1964. Amer. Mus. Novitates 2185: 23. ♂, ♀.

Taxonomy: Timberlake, 1975. Calif. Univ. Pubs. Ent. 77: 14, figs. 9-10 (tax. characters).

**bakeri** (Cockerell). Colo., N. Mex., Ariz.; Mexico (Chihuahua, Michoacan, Morelos and Puebla).

Pollen: Unknown, but visits flowers of *Calochortus gunnisonii*, *Euphorbia*, *Frasera speciosa*, *Helenium hoopesii*, *Heterotheca subaxillaris*, *Linum lewisii*, *Lopezia*, *Monarda austromontana*, *Oxalis*, *Phacelia leucophylla*, *Potentilla filipes*, *P. fruticosa*, *Pseudocymopterus montanus*, *Sedum stenopetalum*, *Solidago*.

*Calliopsis bakeri* Cockerell, 1896. Ent. News 7: 221. ♂.

Taxonomy: Viereck, 1903. Amer. Ent. Soc., Trans. 29: 50. —Cockerell, 1910. Psyche 17: 245. ♂, ♀. —Timberlake, 1964. Amer. Mus. Novitates 2185: 7-8 (geogr. and floral records).

—Timberlake, 1975. Calif. Univ. Pubs. Ent. 77: 15-16, figs. 13-14 (tax. characters, geogr. and floral records).

**dawsoni** (Timberlake). Tex., N. Mex., Colo. Pollen: Unknown, but visits flowers of an unspecified crucifer.

*Pseudopanurgus dawsoni* Timberlake, 1964. Amer. Mus. Novitates 2185: 10. ♀, ♂.

Taxonomy: Timberlake, 1975. Calif. Univ. Pubs. Ent. 77: 20, figs. 23-24 (tax. characters).

**euphorbiae** Timberlake. Ariz. (Pima County); Mexico (Chiapas, Michoacan, Morelos, Nayarit and Puebla).

*Heterosarus euphorbiae* Timberlake, 1975. Calif. Univ. Pubs. Ent. 77: 24, figs. 29-30. ♂, ♀.

**flavotinctus** (Cockerell). N. Mex., Colo., Ariz.; Mexico (Zacatecas). Pollen: Unknown, but visits flowers of *Bigelovia*, *Sphaeralcea*.

*Panurginus pauper* var. *flavotinctus* Cockerell, 1898. Denison. Univ. Sci. Labs., Bul. 11: 51. ♂.

- Taxonomy: Cockerell, 1898. N. Mex. Univ., Bul. 1: 51. ♂. —Cockerell, 1899. Entomologist 32: 129. ♀. —Timberlake, 1964. Amer. Mus. Novitates 2185: 20-23 (redescription).  
 —Timberlake, 1975. Calif. Univ. Pubs. Ent. 77: 26, figs. 33-34 (tax. characters and status).
- illinoiensis** (Cresson). Que. to Fla., west to Ill., Kans., Okla. and Tex. Pollen: Unknown, but visits flowers of *Amphiachyris dracunculoides*, *Bellis integrifolia*, *Chrysanthemum leucanthemum*, *Descourainia*, *Erigeron*, *Gaillardia*, *Heterotheca subaerialis*, *Lepidium*.  
*Calliopsis illinoiensis* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 66. ♂.
- Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 274, figs. 64-66, table 8 (redescription). —Timberlake, 1975. Calif. Univ. Pubs. Ent. 77: 30-31, figs. 43-44 (tax. status, geogr. and floral records).
- nanulus** (Timberlake). N. Mex., Ariz.; Mexico (Baja California, Chihuahua, Durango and Sonora). Parasite: *Holcopasites tegularis* Hurd and Linsley. Pollen: Unknown, but visits flowers of *Euphorbia*, *Physalis*, *Wislizenia refracta*.  
*Pseudopanurgus nanulus* Timberlake, 1964. Amer. Mus. Novitates 2185: 5. ♀, ♂.
- Taxonomy: Timberlake, 1975. Calif. Univ. Pubs. Ent. 77: 37, figs. 55-56 (tax. characters).  
 Biology: Hurd and Linsley, 1972. Smithsn. Contrib. Zool. 114: 26, 39 (parasite).
- neomexicanus** (Cockerell). N. Mex., Ariz.; Mexico (Distrito Federal, Durango, Guanajuato, Hidalgo, Mexico, Michoacan, Morelos, Puebla and Tlaxcala). Pollen: Unknown, but visits flowers of *Cacalia decomposita*, *Ceanothus*, *Erigeron*, *Geranium*, *Helenium hoopesii*, *Monarda austromontana*, *Penstemon*, *Solidago*.  
*Panurginus neomexicanus* Cockerell, 1898. Ann. and Mag. Nat. Hist. (7) 2: 451. ♂.  
*Panurginus nigrinus* Viereck, 1903. Amer. Ent. Soc., Trans. 29: 50. ♀.
- Taxonomy: Timberlake, 1964. Amer. Mus. Novitates 2185: 8-10 (redescription, geogr. and floral records). —Timberlake, 1975. Calif. Univ. Pubs. Ent. 77: 37-38, figs. 57-58 (tax. characters).
- opacicolis** (Timberlake). Ariz. Pollen: Unknown, but visits flowers of *Eriogonum*.  
*Pseudopanurgus opacicolis* Timberlake, 1964. Amer. Mus. Novitates 2185: 15. ♀.
- Taxonomy: Timberlake, 1975. Calif. Univ. Pubs. Ent. 77: 38 (tax. characters).
- opaculus** (Cockerell). Ariz. (Mud Springs, Santa Catalina Mts.).  
*Panurginus opaculus* Cockerell, 1922. Amer. Mus. Novitates 36: 3. ♀.
- Taxonomy: Timberlake, 1964. Amer. Mus. Novitates 2185: 18-20 (redescription).  
 —Timberlake, 1975. Calif. Univ. Pubs. Ent. 77: 39, fig. 87 (tax. characters).
- parvus** (Robertson). Pa., N. C., Ga., Miss., Mo., Ill., Wis., N. Dak., Alta., Colo., N. Mex. Pollen: Unknown, but visits flowers of *Aster*, *Eulophus*, *Geranium*, *Gerardia tenuifolia*, *Gillenia*, *Monarda*, *Solidago*, *Thaspium*.  
*Calliopsis parvus* Robertson, 1892. Amer. Nat. 26: 273. ♀, ♂.  
*Pseudopanurgus gerardiae* Crawford, 1932. Ent. Soc. Wash., Proc. 34: 77. ♂, ♀.  
*Pseudopanurgus stevensi* Crawford, 1932. Ent. Soc. Wash., Proc. 34: 78. ♂, ♀.  
*Panurginus borealis* Cockerell, 1937. Canad. Ent. 69: 33. ♀.
- Taxonomy: Crawford, 1932. Ent. Soc. Wash., Proc. 34: 77 (tax. characters). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 277-278, figs. 64-66, table 8 (synonymy, redescription).  
 —Timberlake, 1964. Amer. Mus. Novitates 2185: 25 (synonymy, as *stevensi*).  
 —Timberlake, 1975. Calif. Univ. Pubs. Ent. 77: 40, figs. 63-64 (synonymy, tax. characters).
- pauper** (Cresson). New England to Fla., west to Ill. and Mo. Pollen: Collects pollen especially from the flowers of *Ceanothus americanus*, but also visits flowers of *Rubus* presumably for nectar.  
*Calliopsis pauper* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 66. ♀, ♂.
- Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 278-279, figs. 64-66, table 8 (redescription). —Timberlake, 1975. Calif. Univ. Pubs. Ent. 77: 40, figs. 65-66 (tax. characters).
- Biology: Timberlake, 1975. Calif. Univ. Pubs. Ent. 77: 40 (pollen source).

**pernitens** (Cockerell). Ariz., N. Mex.

*Panurginus pernitens* Cockerell, 1922. Amer. Mus. Novitates 36: 4. ♀.

Taxonomy: Timberlake, 1964. Amer. Mus. Novitates 2185: 14-15 (redescription).

—Timberlake, 1975. Calif. Univ. Pubs. Ent. 77: 40-41 (tax. characters).

**subglaber** Timberlake. Tex. (Del Rio).

*Heterosarus subglaber* Timberlake, 1975. Calif. Univ. Pubs. Ent. 77: 45, figs. 71-72. ♂.

**townsendi** (Cockerell). Tex., N. Mex., Ariz.

*Calliopsis townsendi* Cockerell, 1897. Amer. Ent. Soc., Trans. 24: 152. ♂.

Taxonomy: Timberlake, 1975. Calif. Univ. Pubs. Ent. 77: 48-49, figs. 77-78. ♂, ♀ (redescription).

**virginicus** (Cockerell). Md. to Ga., W. Va. and Ala. Pollen: Unknown, but visits flowers of *Ceanothus*, *Houstonia purpurea*.

*Panurginus virginicus* Cockerell, 1907. Entomologist 40: 137. ♂.

Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 281-282, figs. 64-66, table 8 (redescription). —Timberlake, 1975. Calif. Univ. Pubs. Ent. 77: 52, figs. 83-84 (tax. characters).

### Genus PTEROSARUS Timberlake

*Pterosarus* Timberlake, 1967. Amer. Mus. Novitates 2298: 10.

Type-species: *Calliopsis rudbeckiae* Robertson. Orig. desig.

Taxonomy: Rozen, 1966. Amer. Mus. Novitates 2259: 5-8, figs. 1-8 (larvae, as *Pseudopanurgus*). —Timberlake, 1967. Amer. Mus. Novitates 2298: 19-22 (Key to spp.).

—Timberlake, 1975. Calif. Univ. Pubs. Ent. 77: 1, 2 (key, tax. status).

**aestivalis** (Provancher). Que.

*Panurgus aestivalis* Provancher, 1882. Nat. Canad. 13: 205. ♀, ♂.

Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 271-272 (tax. characters).

**albitalis** (Cresson). Conn. to Ga., west to Ill., Colo., N. Mex. and Tex., ?Calif. Pollen:

Unknown, but visits flowers of *Aster ericoides villosus*, *Brauneria pallida*, *B. purpurea*, *Coreopsis palmata*, *Helianthus divaricatus*, *H. mollis*, *Lepachys pinnata*, *Rudbeckia hirta*, *R. laciniata*, *R. submentosa*, *Verbesina helianthoides*.

*Panurgus albitalis* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 260. ♀, ♂.

*Panurgus picipes* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 261. ♂.

Taxonomy: Cockerell, 1900. Canad. Ent. 32: 364. ♂. —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 266-267, figs. 62, 65-66, table 8 (synonymy, redescription). —Timberlake, 1967. Amer. Mus. Novitates 2298: 11 (tax. position).

**altissimus** (Cockerell). Colo.

*Panurginus altissimus* Cockerell, 1922. Amer. Mus. Novitates 36: 3. ♂, ♀.

**andrenoides** (Smith). N. B. to N. C., west to Minn. and Ill., ?N. Mex. Pollen: Unknown, but visits flowers of *Aster*, *Rudbeckia triloba*, *Solidago*. Predator: *Philanthus lepidus* Cress.

*Scapter Andrenoides* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 121. ♀.

*Calliopsis asteris* Robertson, 1895. Amer. Ent. Soc., Trans. 22: 121. ♀, ♂.

Taxonomy: Cockerell, 1904. Canad. Ent. 36: 303. ♀. —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 272-273, figs. 64-66, table 8 (synonymy, redescription).

**atricornis** (Cresson). Colo., N. Mex.

*Calliopsis atricornis* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 67. ♂.

*Panurginus atricornis* (!) Viereck, 1903. Amer. Ent. Soc., Trans. 29: 50 (tax. characters).

Taxonomy: Timberlake, 1967. Amer. Mus. Novitates 2298: 11 (tax. position).

**aurifodinae** (Michener). South. Calif., mountains.

*Pseudopanurgus aurifodinae* Michener, 1937. Ann. and Mag. Nat. Hist. (10) 19: 320. ♂.

**barberi** (Cockerell). N. Mex.

*Panurginus barberi* Cockerell, 1899. Entomologist 32: 129. ♂.

**boylei** (Cockerell). Colo., N. Mex., Ariz. Parasite: *Holcopasites insoletus* (Linsley)? Pollen:

Collects pollen from the flowers of *Verbesina encelioides*.

*Calliopsis boylei* Cockerell, 1896. Canad. Ent. 28: 161. ♂.

Taxonomy: Cockerell, 1897. Acad. Nat. Sci., Phila., Proc. 49: 350. — Crawford, 1912. Canad. Ent. 44: 368 (tax. characters). — Rozen, 1966. Amer. Mus. Novitates 2259: 6-7, figs. 1-7 (larva).

Biology: Rozen, 1967. Amer. Mus. Novitates 2297: 19-27, figs. 1-2, tables 1-2 (nest architecture, life history, parasite).

**californicus** (Cresson). Calif.; Mexico (Baja California). Pollen: Unknown, but visits flowers of *Chaenactis glabriuscula*, *Encelia californica*, *Gilia multicaulis*, *Lasthenia californica*, *L. gracilis*, *Layia elegans*, *L. platyglossa*, *Ranunculus californicus*.  
*Calliopsis californicus* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 67. ♂.

**citrinifrons** (Viereck). N. Mex.

*Panurginus citrinifrons* Viereck, 1903. Amer. Ent. Soc., Trans. 29: 51. ♂.

**citripes** (Ashmead). Colo.

*Calliopsis citripes* Ashmead, 1890. Colo. Biol. Assoc., Bul. 1: 5. ♂.

**compositarum** (Robertson). Md. to Ga., west to Ill. Pollen: Unknown, but visits flowers of *Aster*, *Bidens aristosa*, *Boltonia asteroides*, *Polygonum scandens*, *Rudbeckia triloba*, *Solidago nemoralis*, *S. ulmifolia*.

*Calliopsis compositarum* Robertson, 1893. Amer. Ent. Soc., Trans. 20: 274. ♀.

Taxonomy: Robertson, 1895. Amer. Ent. Soc., Trans. 22: 121. ♂. — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 273-274, figs. 64-66 (redescription).

**didirupa** (Cockerell). Idaho, Colo., N. Mex.

*Panurginus didirupa* Cockerell, 1908. Entomologist 41: 293. ♂, ♀.

**expallidus** (Swenk and Cockerell). Nebr.

*Panurginus expallidus* Swenk and Cockerell, 1907. Ent. News 18: 181. ♂.

**helianthi** (Mitchell). Ind. (Tippecanoe Co.). Pollen: Unknown, but visits flowers of *Helianthus annuus*.

*Pseudopanurgus (Pseudopanurgus) helianthi* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 267. ♀.

**horizontalis** (Swenk and Cockerell). Nebr.

*Panurginus horizontalis* Swenk and Cockerell, 1907. Ent. News 18: 183. ♂.

**illustris** (Timberlake). Ariz. (Chiricahua Mts.). Pollen: Unknown, but visits flowers of *Verbesina encelioides*, *Viguiera*.

*Pseudopanurgus illustris* Timberlake, 1967. Amer. Mus. Novitates 2298: 18. ♀.

**innuptus** (Cockerell). Alta., N. Dak., S. Dak., Nebr., Colo., N. Mex., Ariz. Pollen: Unknown, but visits flowers of *Helianthus*.

*Calliopsis innuptus* Cockerell, 1896. Ent. News 7: 222. "♀" = ♂.

*Panurginus albitarsis* var. *fortior* Cockerell, 1899. Entomologist 32: 129. ♂.

*Panurginus innuptus* var. *absonus* Cockerell, 1912. Ent. News 23: 446. ♂.

Taxonomy: Cockerell, 1898. Amer. Ent. Soc., Trans. 25: 194. ♂, ♀.

**irregularis** (Cockerell). Colo.

*Panurginus irregularis* Cockerell, 1922. Amer. Mus. Novitates 36: 2. ♂.

**labrosiformis distractus** (Cockerell). Nebr.

*Panurginus labrosiformis distractus* Cockerell, 1912. Ent. News 23: 447. ♂.

**labrosiformis labrosiformis** (Robertson). N. C., Ga., Ill. Pollen: Unknown, but visits flowers of *Actinomeris alternifolia*, *Bidens aristosa*, *Coreopsis tripteris*, *Helianthus divaricatus*, *H. tuberosus*, *Heliopsis helianthoides*, *Rudbeckia laciniata*, *R. triloba*, *Silphium perfoliatum*, *Solidago canadensis*.

*Panurginus labrosiformis* Robertson, 1898. Acad. Sci. St. Louis, Trans. 8: 49. ♀, ♂.

Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 274-275, figs. 64-66, table 8 (redescription).

- labrosus** (Robertson). N. Y. to N. C., west to Minn. Pollen: Unknown, but visits flowers of *Helianthus divaricatus*, *H. tuberosus*, *Heliopsis*, *Rudbeckia lanceolata*, *R. triloba*.  
*Calliopsis labrosus* Robertson, 1895. Amer. Ent. Soc., Trans. 22: 122. ♀, ♂.
- Taxonomy: Robertson, 1898. Acad. Sci. St. Louis, Trans. 8: 48, ♀, ♂. — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 268-269, figs. 62, 65-66, table 8 (redescription).
- leucopterus** (Cockerell). Colo.  
*Panurginus leucopterus* Cockerell, 1923. Ent. News 34: 49. ♂.
- lutzae** (Cockerell). Colo.  
*Panurginus lutzae* Cockerell, 1922. Amer. Mus. Novitates 36: 7. ♀.
- nebrascensis muesebecki** (Michener). N. C. to Fla., Miss. Pollen: Unknown, but visits flowers of *Aster*, *Chrysopsis*, *Haplopappus*.  
*Pseudopanurgus nebrascensis timberlakei* Michener, 1947. Amer. Midland Nat. 38: 446. ♂, ♀. Preocc.
- Pseudopanurgus (Heterosarus) nebrascensis muesebecki* Michener, 1951. In Muesebeck, Krombein and Townes, U. S. Dept. Agr., Agr. Monog. 2: 1100. N. name.
- Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 276-277, fig. 65, table 8 (redescription, geogr. range).
- nebrascensis nebrascensis** (Crawford). Maine to N. J., west to Colo. and Alta. Pollen: Unknown, but visits flowers of *Aster*, *Solidago*.  
*Panurginus nebrascensis* Crawford, 1903. Canad. Ent. 35: 335. ♂, ♀.
- Taxonomy: Crawford, 1912. Canad. Ent. 44: 368 (tax. characters). — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 275-276, figs. 64-66, table 8 (redescription).
- nubis** (Cockerell). N. Mex.  
*Panurginus nubis* Cockerell, 1913. Ann. and Mag. Nat. Hist. (8) 11: 193. ♀.
- occidus** (Timberlake). Ariz. Parasite: *Holcopasites arizonicus* (Linsley)? Pollen: *Aplopappus gracilis*, *Helianthus*, *Heterotheca subaxillaris*, *Verbesina encelioides*.  
*Pseudopanurgus (Pterosarus) occidus* Timberlake, 1967. Amer. Mus. Novitates 2298: 14. ♀, ♂.
- Taxonomy: Rozen, 1966. Amer. Mus. Novitates 2259: 7-8, fig. 8 (larva, as species A).
- Biology: Rozen, 1965. N. Y. Ent. Soc., Jour. 73: 88 (parasite). — Hurd and Linsley, 1972. Smithsn. Contrib. Zool. 114: 39 (parasite).
- ornatipes** (Cresson). Nebr., Colo., Tex.  
*Calliopsis ornatipes* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 260. ♂.
- Taxonomy: Crawford, 1912. Canad. Ent. 44: 368. (tax. characters).
- pecki** (Cockerell). Alta.  
*Panurginus pecki* Cockerell, 1937. Canad. Ent. 69: 114. ♂.
- perlaevis** (Cockerell). Colo., N. Mex., Ariz. Parasite: *Holcopasites insoletus* (Linsley)?  
*Calliopsis perlaevis* Cockerell, 1896. Canad. Ent. 28: 160. ♀.
- Taxonomy: Cockerell, 1922. Amer. Mus. Novitates 36: 5.
- Biology: Hurd and Linsley, 1972. Smithsn. Contrib. Zool. 114: 39 (parasite).
- piercei albertensis** (Cockerell). Alta.  
*Panurginus piercei albertensis* Cockerell, 1937. Canad. Ent. 69: 33. ♀.
- piercei piercei** (Crawford). N. Dak., Nebr., Colo., N. Mex.  
*Panurginus piercei* Crawford, 1903. Canad. Ent. 35: 335. ♂, ♀.
- Biology: Pierce, 1904. Nebr. Univ., Studies 4: 185. — Hicks, 1936. Canad. Ent. 68: 47 (nesting habits).
- porterae** (Cockerell). N. Mex., Colo., Ariz.  
*Panurginus Porterae* Cockerell, 1900. Canad. Ent. 32: 364. ♂, ♀.
- pulchricornis** (Cockerell). Colo.  
*Panurginus pulchricornis* Cockerell, 1922. Amer. Mus. Novitates 36: 8. ♀.
- renimaculatus** (Cockerell). N. Dak., Wyo., Nebr., Colo., N. Mex., Tex.  
*Calliopsis renimaculatus* Cockerell, 1896. Ent. News 7: 222. ♀.

- Taxonomy: Swenk and Cockerell, 1907. Ent. News 18: 180. ♀ (only). — Crawford, 1915. U. S. Natl. Mus., Proc. 94: 579. ♀, ♂. — Stevens, 1919. Canad. Ent. 51: 208. ♂.
- rudbeckiae** (Robertson). Wis., Ill. Pollen: Unknown, but visits flowers of *Aster*, *Bidens aristosa*, *Helianthus divaricatus*, *Rudbeckia hirta*, *R. laciniata*, *R. submentosa*, *R. triloba*.
- Calliopsis rudbeckiae* Robertson, 1895. Amer. Ent. Soc., Trans. 22: 122. ♀, ♂.
- Biology: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 279-280, figs. 64-66, table 8 (redescription).
- simulans** (Swenk and Cockerell). N. Dak., Nebr.
- Panurginus simulans* Swenk and Cockerell, 1907. Ent. News 18: 182. ♂, ♀.
- solidaginis** (Robertson). New England west to Ill., south to Miss. Pollen: Unknown, but visits flowers of *Bidens aristosa*, *Boltonia asteroides*, *Coreopsis tripteris*, *Helianthus grosse-serratus*, *H. tuberosus*, *Rudbeckia submentosa*, *Solidago canadensis*.
- Calliopsis solidaginis* Robertson, 1893. Amer. Ent. Soc., Trans. 20: 274. ♀.
- Taxonomy: Robertson, 1898. Acad. Sci. St. Louis, Trans. 8: 50. ♂. — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 280-281, figs. 64-66, table 8 (redescription).
- stathamae** (Timberlake). Ariz. (Southwestern Research Station).
- Pseudopanurgus (Pterosarus) stathamae* Timberlake, 1967. Amer. Mus. Novitates 2298: 16. ♀.
- stigmalis** (Swenk and Cockerell). Nebr.
- Panurginus stigmalis* Swenk and Cockerell, 1907. Ent. News 18: 180. ♂, ♀.
- vicinus** (Timberlake). Ariz. (Cochise County). Pollen: Unknown, but visits flowers of *Aplopappus gracilis*.
- Pseudopanurgus (Pterosarus) vicinus* Timberlake, 1967. Amer. Mus. Novitates 2298: 11. ♀, ♂.
- ximenesiae** (Cockerell). N. Mex.
- Panurginus ximenesiae* Cockerell, 1913. Ann. and Mag. Nat. Hist. (8) 11: 195. ♀.

#### Genus METAPSAENYTHIA Timberlake

- Metapsaenythia* Timberlake, 1969. Ent. News 80: 89.
- Type-species: *Calliopsis abdominalis* Cresson. Orig. design.
- Taxonomy: Timberlake, 1969. Ent. News 80: 89-92 (N. Amer. spp.). — Timberlake, 1973. Calif. Univ. Pubs. Ent. 72: 1 (tax. relationships).
- abdominalis abdominalis** (Cresson). Tex., Kans. Pollen: Collects pollen from flowers of *Monarda*, but visits other flowers for nectar including *Aster tanacetifolius*, *Brazoria truncata*, *Dalea aurea*, *Gaillardia*, *Helianthus annuus*.
- Calliopsis abdominalis* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 68. ♀, ♂.
- Camptopoeum semirufum* Cockerell, 1937. Amer. Mus. Novitates 899: 1. ♀.
- Biology: Timberlake, 1969. Ent. News 80: 90 (floral relationships).
- abdominalis tricolor** (Cockerell). N. J. and Pa. to Ga. Pollen: Apparently an oligolege of *Monarda* including *M. punctata*.
- Calliopsis tricolor* Cockerell, 1897. Amer. Ent. Soc., Trans. 24: 151. ♀.
- Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 270-271, figs. 62-63, 66, table 8 (redescription). — Timberlake, 1969. Ent. News 80: 90-91 (tax. status).

#### Genus NOMADOPSIS Ashmead

- Revision: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 1-202, 218 figs., 17 maps (monograph, includes information on biology, systematics and ecology).
- Taxonomy: Cockerell, 1898. Amer. Ent. Soc., Trans. 25: 195-198 (tax. status and characters). — Timberlake, 1952. Ent. Soc. Amer., Ann. 45: 104-107 (tax. status). — Rozen, 1959. Ent. Soc. Wash., Proc. 61: 255-259 (geogr. and floral records). — Rozen, 1966. Amer. Mus. Novitates 2259: 5, 16 (larvae). — Yager and Rozen, 1966. Amer. Mus. Novitates 2265: 6-8, figs. 3-10 (pupae).

Biology: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 4-54 (life history, nest architecture, adult behavior, comparative ecology, floral relationships, parasites, predators). — Rozen, 1963. Amer. Mus. Novitates 2142: 1-17, 20 figs., 2 tables (nest architecture, life history, floral relationships). — Rozen, 1967. Amer. Mus. Novitates 2297: 1-44, 18 figs. 2 tables (review).

#### Genus NOMADOPSIS Subgenus NOMADOPSIS Ashmead

*Nomadopsis* Ashmead, 1898. Psyche 8: 285.

Type-species: *Peridita zonalis* Cresson. Monotypic and orig. desig. Lapsus for *Calliopsis zonalis* Cresson.

*Spinoliella* subg. *Claremontiella* Cockerell, 1933. Pan-Pacific Ent. 9: 25.

Type-species: *Calliopsis zonalis* Cresson. Monotypic and orig. desig. (= *Spinoliella eurantha* Cockerell).

Taxonomy: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 60-63 (tax. status).

**cincta cincta** (Cresson). Calif. (east side of Sierra Nevada, Tulare and Trinity Counties), Nevada. Pollen: Apparently an oligolege of *Calochortus* including *C. luteus*. *Calliopsis cinctus* Cresson, 1879. Amer. Ent. Soc., Trans. 7: 201. ♀, ♂.

Taxonomy: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 83, figs. 94-98, map 4 (redescription, tax. status).

**cincta hurdi** Rozen. Calif. (Sacramento). Pollen: Collects pollen from the flowers of *Calochortus luteus*.

*Nomadopsis cincta hurdi* Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 85. ♂, ♀.

**comptula** (Cockerell). Calif. (Tulare, Inyo, and San Bernardino Counties). Pollen: Collects pollen from the flowers *Potentilla*, including *P. bolanderi* var. *bernardina*, *P. b.* var. *parryi*, *P. gracilis*, but visits these and other flowers including *Calochortus palmeri* var. *paludicola* for nectar.

*Spinoliella comptula* Cockerell, 1916. Ann. and Mag. Nat. Hist. (8) 17: 284. ♀.

*Spinoliella edwardsii media* Michener, 1937. Ann. and Mag. Nat. Hist. (10) 19: 325. ♀, ♂.

*Spinoliella edwardsii bernardina* Michener, 1937. Ann. and Mag. Nat. Hist. (10) 19: 326. ♀, ♂.

Taxonomy: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 75-77, figs. 79-83, map 3 (redescription, synonymy).

Biology: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 7, 31, 75 (nest site, mating, floral relationships).

**edwardsii** (Cresson). Calif., Oreg., Wash., Idaho. Pollen: Collects pollen from flowers of *Calochortus*, *Chamaebatia foliolosa*, *Potentilla* including *P. bolanderi* var. *parryi*, *P. congesta*, *P. fusca*, *P. glandulosa*, *P. tridentata*, but visits these and other flowers for nectar including *Clarkia rhomboidea*, *Eriogonum marifolium*, *Fragaria californica*, *Iris hartwegii*, *Lathyrus sulphureus*, *Spraguea umbellata*.

*Calliopsis edwardsii* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 64. ♀, ♂.

*Calliopsis lateralis* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 65. ♀.

*Spinoliella triangulifera* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 195. ♀.

Taxonomy: Michener, 1937. Ann. and Mag. Nat. Hist. (10) 19: 325, ♂ (as *triangulifera*).

— Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 77-81, figs. 4-5, 28-29, 64, 84-88, map 3 (redescription, synonymy, larva).

Biology: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 6, 28-31, 81 (nest site, mating behavior, floral relationships).

**linsleyi** Rozen. Calif.; Mexico (Baja California). Pollen: Collects pollen from the flowers of *Eriodictyon*, including *E. angustifolium*, *E. crassifolium*, *E. parryi*, *E. trichocalyx*, but visits these and other flowers for nectar including *Arctostaphylos*, *Ceanothus*.

*Nomadopsis linsleyi* Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 85, figs. 6, 7, 30, 31, 53, 99-103, map 5. ♂, ♀.

**obscura** (Cresson). Calif., Oreg., Ariz. (Tucson), ?Wash.; Mexico (Baja California). Pollen: Apparently oligolectic on *Eschscholzia*, especially *E. californica*, but visits other flowers



including *Agoseris glauca*, *Calendula*, *Ceanothus*, *Chaenactis glabriuscula*, *Coreopsis lanceolata*, *Cryptantha intermedia*, *Lasthenia*, *Layia platyglossa*, *L. p. breviseta*, *Malacothrix californica*, *Nemophila menziesii*, *Phacelia davidsonii*, *P. distans*, *P. tanacetifolia*, *Sida malvaeflora*, *Sphaeralcea*.

*Calliopsis obscurellus* Cresson, 1879. Amer. Ent. Soc., Trans. 7: 201. ♀, ♂.

Taxonomy: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 91-93, figs. 104-108, map 7 (redescription).

Biology: Timberlake, 1952. Ent. Soc. Amer., Ann. 45: 107 (mating). — Rozen, 1958. Calif.

Univ. Pubs. Ent. 15: 32, 93 (mating, floral relationships).

**puellae** (Cockerell). Tex., N. Mex., Ariz., Nev., Calif., Idaho.; Mexico (Baja California). Parasite: *Oreopasites vanduzeei* Cockerell. Pollen: Evidently collects pollen chiefly from the flowers of *Malacothrix* including *M. californica*, *M. exigua*, *M. glabrata*, but visits other flowers including *Anisocoma acaulis*, *Aster abatus*, *Astragalus*, *Baileya pleniradiata*, *Calycoseris wrightii*, *Chaenactis fremontii*, *Encelia farinosa*, *Haplopappus cooperi*, *H. linearifolius*, *Rafinesquia neomexicana*.

*Spinoliella puellae* Cockerell, 1933. Pan-Pacific Ent. 9: 25. ♀, ♂.

Taxonomy: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 89-91, figs. 89-93, map 6 (redescription).

— Rozen, 1959. Ent. Soc. Wash., Proc. 61: 255 (geogr. records). — Yager and Rozen, 1966. Amer. Mus. Novitates 2265: 8 (pupa).

Biology: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 8, 31, 54, 89 (nest site, mating behavior, parasites, floral relationships).

**timberlakei** Rozen. Calif. (Los Angeles County), desert. Pollen: Possibly an oligolege of *Monardella exilis*.

*Nomadopsis timberlakei* Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 73, map 2. ♂, ♀.

**zonalis sierrae** Rozen. Calif. (Sierra Nevada Mts.). Parasite: *Oreopasites* sp. Pollen: Collects pollen from the flowers of *Monardella lanceolata*, but visits these and other flowers for nectar and or pollen including *Solidago californica*.

*Nomadopsis zonalis sierrae* Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 71-73, map 2. ♂, ♀.

Taxonomy: Rozen, 1963. Amer. Mus. Novitates 2142: 3-5, figs. 1-2, table 1 (immature stages).

— Yager and Rozen, 1966. Amer. Mus. Novitates 2265: 7-8, figs. 7-8 (pupa).

Biology: Rozen, 1963. Amer. Mus. Novitates 2142: 2-6 (nest site, nest architecture, floral relationships, parasite).

**zonalis zonalis** (Cresson). Calif. (central and south coasts). Pollen: Collects pollen from the flowers of *Monardella douglasii*, *M. lanceolata*.

*Calliopsis zonalis* Cresson, 1879. Amer. Ent. Soc., Trans. 7: 201. ♂.

*Spinoliella eurantha* Cockerell, 1916. Ann. and Mag. Nat. Hist. (8) 17: 283. ♀.

Taxonomy: Timberlake, 1951. In Muesebeck, Krombein and Townes, U. S. Dept. Agr., Agr.

Monog. 2: 1102 (synonymy). — Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 69-71, figs. 66, 74-78, map 2 (redescription).

Biology: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 70-71 (floral relationships).

### Genus NOMADOPSIS Subgenus MACRONOMADOPSIS Rozen

*Nomadopsis* subg. *Macronomadopsis* Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 93.

Type-species: *Nomadopsis micheneri* Rozen. Orig. desig.

**anthidia anthidia** (Fowler). Oreg., Calif. (west slope of Sierra Nevada, northern Coast Ranges, Sacramento Valley, part of San Joaquin Valley). Parasite: *Euphytomima nomiivora* James, *Oreopasites vanduzeei melanantha* Linsley. Pollen: Collects pollen from the flowers of *Trifolium* including *T. involucreatum*, *T. melananthum*, *T. microcephalum*, *T. monanthum* var. *parvum*, *T. repens*, *T. tridentatum*, *T. variegatum*, but visits these and other flowers for nectar including *Eriodictyon trichocalyx*, *Lupinus bicolor*. Predator: *Solenopsis* sp.

*Calliopsis anthidius* Fowler, 1899. Psyche 8: 407. ♂ (♀ misdet.).

Taxonomy: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 99-102, figs. 8, 9, 56, 63, 119-123, map 9 (tax. status, redescription, larva). — Rozen, 1959. Ent. Soc. Wash., Proc. 61: 258 (gender of name). — Yager and Rozen, 1966. Amer. Mus. Novitates 2265: 8, figs. 9-10 (pupa).

Biology: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 8-9, 32-34, 53, 101 (nest site, nest architecture, mating behavior, floral relationships, parasite, predator, larva). — Moradeshaghi and Bohart, 1968. Kans. Ent. Soc., Jour. 41: 456-473, 15 figs., 3 tables (parasite).

**anthidia lutea** Rozen. Calif. (east of Sierra and southern Calif.), Oreg., Idaho, Utah. Pollen:

Collects pollen from the flowers of *Trifolium* including *T. involucratum*, *T. repens*.

*Nomadopsis anthidius lutea* Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 102, figs. 2, 3, 10, 11, 34, 35, 57, 124-128, map 9. ♂, ♀.

Biology: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 9, 34, 101 (nest site, mating behavior, floral relationships).

**barri** Rozen. Idaho, Oreg. Pollen: Unknown, but visits flowers of *Melilotus*.

*Nomadopsis (Macronomadopsis) barri* Rozen, 1959. Ent. Soc. Wash., Proc. 61: 256, figs. 1, 4. ♂, ♀.

**filiorum** Rozen. Calif. (Mono Co.). Pollen: Probably collects pollen from the flowers of *Trifolium*.

*Nomadopsis (Macronomadopsis) filiorum* Rozen, 1963. Amer. Mus. Novitates 2142: 6, figs. 3-6. ♂, ♀.

Biology: Rozen, 1963. Amer. Mus. Novitates 2142: 3-6, tables 1-2 (nest site, nest architecture, floral relationships).

**micheneri** Rozen. Calif. (Sierra Nevada and Trinity Mt.). Pollen: Collects pollen from the flowers of *Trifolium* including *T. gracilentum*, *T. monanthus* var. *parvum*, *T. repens*.

*Nomadopsis micheneri* Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 95, figs. 12, 13, 32, 33, 55, 67, 109-113, map 8. ♂, ♀.

Biology: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 9-12, 34-36, 43, 53, 98 (nest site, nest architecture, mating behavior, floral relationships).

**zebrata bobbae** Rozen. Ariz. (Navajo and Coconino Counties).

*Nomadopsis zebrata bobbae* Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 107, map 8. ♂, ♀.

**zebrata zebrata** (Cresson). S. Dak., Wyo., Colo., N. Mex. Pollen: Collects pollen from the flowers of *Astragalus*.

*Calliopsis zebratus* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 64. ♀.

Taxonomy: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 103-107, figs. 114-118, map 8 (tax. status, redescription).

Biology: Cockerell, 1915. Ent. News 26: 366 (nest site). — Hicks, 1936. Canad. Ent. 68: 47 (nest). — Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 35 (nest site).

#### Genus NOMADOPSIS Subgenus MICRONOMADOPSIS Rozen

*Nomadopsis* subg. *Micronomadopsis* Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 107.

Type-species: *Nomadopsis fracta* Rozen. Orig. design.

**australior** (Cockerell). S. Dak., Nebr., Colo., Utah, N. Mex., Tex., Ariz.; Mexico (Chihuahua).

Pollen: Collects pollen from the flowers of *Lepidium alyssoides*, *L. montanum*, but may also obtain pollen from the flowers of *Dithyrea wislizeni*.

*Calliopsis australior* Cockerell, 1897. Acad. Nat. Sci. Phila., Proc. 49: 349. ♀ (♂ misdet.).

Taxonomy: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 149-152, figs. 71, 182-185, map 15. ♂, ♀ (redescription). — Rozen, 1959. Ent. Soc. Wash., Proc. 61: 259 (geogr. rec.).

Biology: Custer, 1927. Psyche 34: 199 (nesting activities). — Custer, 1929. Canad. Ent. 61: 49 (nest). — Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 8, 152 (nest site, floral relationships).

- barbata** Timberlake. South. Calif., north into Central Valley. Parasite: *Oreopasites* sp. Pollen: Collects pollen from the flowers of *Phacelia* including *P. distans*, *P. tanacetifolia*, but visits these and other flowers for nectar including *Cryptantha*, *Linanthus dianthiflorus*.  
*Nomadopsis barbata* Timberlake, 1952. Ent. Soc. Amer., Ann. 45: 107. ♂, ♀.
- Taxonomy: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 114-117, figs. 18-19, 42-43, 59, 133-136, map 11 (redescription, larva).
- Biology: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 8, 36, 40, 117, table 2 (nest site, nesting activity, mating behavior, floral relationships, parasite).
- beamerorum** Rozen. Tex. (Reeves and Pecos Counties). Pollen: Unknown, but holotype male was visiting flowers of *Prosopis*.  
*Nomadopsis (Micronomadopsis) beamerorum* Rozen, 1963. Amer. Mus. Novitates 2142: 13, figs. 12-15. ♂, ♀.
- callosa** Timberlake. Tex. (El Paso Co.); Mexico (Baja California).  
*Nomadopsis callosa* Timberlake, 1952. Ent. Soc. Amer., Ann. 45: 110. ♂.
- Taxonomy: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 140-142, figs. 174-177, map 8 (redescription). — Rozen, 1959. Ent. Soc. Wash., Proc. 61: 259 (type).
- cazieri** Rozen. Calif. (San Jacinto Mts. and San Diego County).  
*Nomadopsis cazieri* Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 135, figs. 165-169, map 14. ♂, ♀.
- foleyi** Timberlake. South. Calif., deserts. Pollen: Collects pollen from the flowers of *Larrea tridentata*, but visits these and other flowers for nectar including *Heliotropium*, *Nama hispida*.  
*Nomadopsis foleyi* Timberlake, 1952. Ent. Soc. Amer., Ann. 45: 112. ♀, ♂.
- Taxonomy: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 119-121, figs. 141-144, map 10 (redescription).
- Biology: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 121 (floral relationships).
- fracta** Rozen. Calif. (widely distributed at lower altitudes). Pollen: Collects pollen from the flowers of *Eriodictyon angustifolium*, *E. californicum*, *E. crassifolium*, *E. trichocalyx*, but visits these and presumably other flowers for nectar including *Ceanothus integerrimus*, *Chaenactis*, *Chamaebatia foliolosa*, *Cryptantha intermedia*, *Erigeron divergens*, *Eriogonum fasciculatum*, *Gilia exilis*, *Mimulus fremontii*, *Nama parryi*, *Phacelia brachyloba*, *P. douglasii*.  
*Nomadopsis fracta* Rozen, 1952. Kans. Ent. Soc., Jour. 25: 144, 4 figs. ♂, ♀.
- Taxonomy: Michener, 1953. Kans. Univ. Sci. Bul. 35: 1036, figs. 92-98 (larva). — Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 111-113, figs. 36-37, 68-69, 129-132, map 10 (redescription, larva).
- Biology: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 36, 39, 48-50, 55, 60, 113 (mating behavior, sleep, flower relationships, voltinism).
- helianthi** (Swenk and Cockerell). Nebr. and N. Mex., west to Calif.; Mexico (Baja California). Parasite: *Oreopasites euphorbiae* Kkll. Pollen: Collects pollen from the flowers of *Euphorbia albomarginata*, *E. polycarpa*, but visits these and other flowers for nectar including *Cryptantha intermedia*, *Eremocarpus setigerus*, *Eriogonum fasciculatum*, *E. gracile*, *Gutierrezia sarothrae*, *Helianthus*, *Heliotropium curassavicum*, *Hemizonia paniculata*.  
*Spinoliella helianthi* Swenk and Cockerell, 1907. Ent. News 18: 178. ♀.  
*Spinoliella euphorbiae* Cockerell, 1925. Pan-Pacific Ent. 1: 179. ♀.
- Taxonomy: Michener, 1953. Kans. Univ. Sci. Bul. 35: 1036, figs. 99, 106-108 (larva, as *euphorbiae*). — Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 133, map 13 (type). — Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 129-133, figs. 16-17, 40-41, 61, 65, 157-160, map 13 (as *euphorbiae*, redescription, larva). — Rozen, 1963. N. Y. Ent. Soc., Jour. 7: 142-143 (synonymy).

- Biology: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 11, 16-17, 37, 40, 43, 48-49, 50, 55, 59, 133 (adult activity, defecation, floral relationships, habitat, hibernation, mating behavior, sleep, parasitism, voltinism).
- hesperia equina** (Cockerell). Calif. (Great Valley), Nev. (Virginia City). Parasite: *Oreopasites vanduzeei* Ckll. Pollen: Collects pollen from the flowers of *Heliotropium curassavicum*, but visits these and other flowers for nectar including *Erodium cicutarium*, *Hemizonia pungens*, *Medicago sativa*.  
*Spinoliella equina* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 196. ♀, ♂.
- Taxonomy: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 148-149 (redescription). — Yager and Rozen, 1966. Amer. Mus. Novitates 2265: 6-7, figs. 5-6 (pupa).
- Biology: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 49, 59, 147 (flower relationships, parasite).
- hesperia hesperia** (Swenk and Cockerell). South. Calif. Pollen: Collects pollen from the flowers of *Heliotropium curassavicum oculatum*.  
*Spinoliella hesperia* Swenk and Cockerell, 1907. Ent. News 18: 186. ♀, ♂.
- Taxonomy: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 147-148, figs. 20-21, 44-46, 70, 178-181, map 15 (redescription).
- Biology: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 49, 59, 147 (floral relationships).
- larreae** Timberlake. South. Calif. (Colorado and Mojave Deserts). Ecology: Nest sites are established in sand dune areas. Pollen: Collects pollen from the flowers of *Larrea tridentata*.  
*Nomadopsis larreae* Timberlake, 1952. Ent. Soc. Amer., Ann. 45: 111. ♀.
- Taxonomy: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 126-128, figs. 153-156, map 12 (redescription).
- Biology: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 11, 37, 41, 43, 49, 55, 128 (nest site, nest architecture, nesting activities, mating behavior, floral relationships).
- macswaini** Rozen. Ariz. Pollen: Evidently collects pollen from the flowers of *Wislizenia refracta*.  
*Nomadopsis macswaini* Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 152, figs. 195-198, map 16. ♂, ♀.
- meliloti** (Cockerell). Tex., N. Mex., Ariz. (Willcox). Pollen: Pollen-laden females have been collected at the flowers of *Dalea scoparia*, but also visits flowers of *Melilotus*.  
*Calliopsis meliloti* Cockerell, 1896. Canad. Ent. 28: 158. ♀.
- Taxonomy: Cockerell, 1933. Pan-Pacific Ent. 9: 158. ♂, ♀. — Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 138-140, figs. 170-173, map 14 (redescription). — Rozen, 1959. Ent. Soc. Wash., Proc. 61: 259 (geogr. record).
- mellipes** Timberlake. South. Calif. Pollen: Apparently collects pollen from the flowers of *Lotus* including *L. glaber*, *L. hamatus*, *L. salsuginosus*, *L. scoparius*, *L. strigosus*, but visits these and apparently other flowers for nectar including *Camissonia dentata*, *Encelia*.  
*Nomadopsis mellipes* Timberlake, 1952. Ent. Soc. Amer., Ann. 45: 109. ♂, ♀.
- Taxonomy: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 125-126, figs. 149-152, map 12 (redescription).
- Biology: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 126 (floral relationships).
- nigromaculata** Timberlake. South. Calif., Ariz., deserts. Pollen: Apparently collects pollen from the flowers of *Euphorbia polycarpa* including *E. p.* var. *hirtella*, but visits other flowers including *Eriogonum trichopes*, *Pectis papposa* possibly for nectar.  
*Nomadopsis nigromaculata* Timberlake, 1952. Ent. Soc. Amer., Ann. 45: 115. ♀, ♂.
- Taxonomy: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 133-135, figs. 161-164, map 14 (redescription).
- Biology: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 37-38, 50, 52, 135 (mating behavior, adult behavior, floral relationships, voltinism).

**personata** (Cockerell). Wash., Oreg., Idaho, Wyo. Pollen: Pollen laden females have been collected at the flowers of *Cleome lutea*, *C. serrulata*.

*Calliopsis personatus* Cockerell, 1897. Acad. Nat. Sci. Phila., Proc. 49: 349. ♀.

Taxonomy: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 165-167, figs. 186-189, map 15 (redescription). — Yager and Rozen, 1966. Amer. Mus. Novitates 2265: 7 (pupa).

Biology: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 167 (floral relationships).

**phaceliae** Timberlake. Calif. (chiefly east side of Sierra Nevada and Mojave Desert). Pollen: Apparently collects pollen from the flowers of *Phacelia fremontii*, but visits these and other flowers for nectar including *Euphorbia albomarginata*, *Hesperochiron californicum*, *Nama demissum*.

*Nomadopsis phaceliae* Timberlake, 1952. Ent. Soc. Amer., Ann. 45: 116. ♂.

Taxonomy: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 117-119, figs. 137-140, map 11 (redescription). — Rozen, 1959. Ent. Soc. Wash., Proc. 61: 258-259 (geogr. and floral records).

Biology: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 119 (floral relationships).

**scitula lawae** (Michener). Calif. (Inyo, Lassen and Mono Counties), Nev. (Fallon). Pollen: A female laden with pollen has been taken at the flowers of *Thelypodium brachycarpum*, others at flowers of *Cleome* and a male at the flowers of *Cleomella oocarpa*.

*Spinoliella lawae* Michener, 1937. Ann. and Mag. Nat. Hist. (10) 19: 324. ♀.

Taxonomy: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 156-157, 159-160, map 16 (redescription).

Biology: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 160 (floral relationships).

**scitula scitula** (Cresson). Wyo., Idaho, Utah, Colo., N. Mex.; variants occur in Br C., Oreg., northeast. Calif., northeast. Nev., Colo. and Wyo. Parasite: *Oreopasites scituli* Ckll.

Pollen: Females with pollen-laden hind legs have been collected at the flowers of *Cleome serrulata*, *Sisymbrium altissimum*.

*Calliopsis scitulus* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 64. ♀.

*Calliopsis pictipes* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 65. ♂.

Taxonomy: Cockerell, 1897. Acad. Nat. Sci. Phila., Proc. 49: 348 (tax. characters).

— Timberlake, 1951. In Muesebeck, Krombein and Townes, U. S. Dept. Agr., Agr. Monog. 2: 1102 (synonymy). — Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 21, 154-159, figs. 72, 199-203, map 16 (redescription, tax status, larva). — Yager and Rozen, 1966. Amer. Mus. Novitates 2265: 7 (pupa).

Biology: Cockerell, 1906. Amer. Mus. Nat. Hist., Bul. 22: 440 (parasite). — Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 12, 40, 47, 159 (nest site, nesting activities, floral relationships.)

**scutellaris scutellaris** (Fowler). Wyo., Idaho, Utah, Nev., Wash., Oreg., Calif., Ariz.; Mexico (northern Baja California). Parasite: *Euphytomima nomiivora* James, *Myrmosula rutilans* (Fowler), *Oreopasites* sp. Pollen: Apparently polylectic, pollen-laden females have been collected from the flowers of *Heliotropium curassavicum*, *Mesembryanthemum*, *Sesuvium sessile*, *Wislizenia refracta*, alsike clover, ladino clover, carrots, but also visits other flowers including *Alyssum maritimum*, *Brassica incana*, *Chrysanthemum*, *Cressa truxillense*, *Gutierrezia sarothrae*, *Melilotus indica*, *Phacelia fremontii*, *Raphanus sativus*, *Sesuvium verrucosum*, *Solidago*, *Tamarix*. Another subspecies, *N. scutellaris peninsularis* (Cockerell), occurs in southern Baja California.

*Calliopsis scutellaris* Fowler, 1899. Psyche 8: 406. ♂.

*Calliopsis visaliensis* Fowler, 1899. Psyche 8: 406. ♀.

Taxonomy: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 20, 23, 24, 25, 27, 30, 160-165, figs. 24-25, 47-48, 62, 73, 190-194, map 17 (redescription, larva). — Yager and Rozen, 1966. Amer. Mus. Novitates 2265: 7 (pupa).

Biology: Snelling, 1954. Pan-Pacific Ent. 30: 124 (parasite). — Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 12, 15, 38, 40, 48, 53-54, 164 (nest, site, nest architecture, life history, mating behavior, parasite). — Moradeshaghi and Bohart, 1968. Kans. Ent. Soc., Jour. 41: 456-473, 15 figs., 3 tables (parasite).

- snellingi** Rozen. Calif. (Squaw Valley). Pollen: Unknown, but visits flowers of *Salvia*.  
*Nomadopsis (Micronomadopsis) snellingi* Rozen, 1963. Amer. Mus. Novitates 2142: 9, figs. 7-11. ♂, ♀.
- trifolii** Timberlake. Calif. Pollen: Collects pollen from the flowers of *Mimulus fremontii*, *Trifolium melananthum*, *T. tridentatum*, *T. variegatum*, but also visits other flowers including *Cryptantha*, *Eriodictyon*, *Salix*.  
*Nomadopsis trifolii* Timberlake, 1952. Ent. Soc. Amer., Ann. 45: 113. ♀, ♂.
- Taxonomy: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 14, 19, 23, 26, 30, 121-123, figs. 14-15, 38-39, 60, 145-148, map 12 (redescription, egg, larva).
- Biology: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 10, 15, 17, 35, 40, 48-50, 123 (nest site, nest architecture, life history, mating behavior, hibernation, sleep, voltinism, floral relationships).
- Genus NOMADOPSIS Subgenus UNASSIGNED**
- boharti** Rozen. Calif. (Eldorado, Napa and Tuolumne Counties).  
*Nomadopsis boharti* Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 171, figs. 204-208, map 7. ♂, ♀.
- Taxonomy: Yager and Rozen, 1966. Amer. Mus. Novitates 2265: 8 (pupa).
- interrupta** (Provancher). Ont. (Toronto).  
*Calliopsis interrupta* Provancher, 1888. Addit. Corr. Faune Ent. Canada, Hym., p. 320. ♀.
- Taxonomy: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 174. (tax. status).
- quadrilineata** (Provancher). Ont. (Toronto).  
*Calliopsis 4-lineata* Provancher, 1888. Addit. Corr. Faune Ent. Canada, Hym., p. 319. ♀.  
*Calliopsis quadrilineata* Dalla Torre, 1896. Cat. Hym., v. 10, p. 174. Emend.
- Taxonomy: Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 174 (tax. status).
- smithi** Rozen. Calif. (San Benito County). Pollen: Unknown, but visits flowers of *Cryptantha*.  
*Nomadopsis smithi* Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 169, figs. 214-218, map 7. ♂, ♀.
- solitaria** Rozen. Calif. (Lassen County).  
*Nomadopsis solitaria* Rozen, 1963. Amer. Mus. Novitates 2142: 15, figs. 16-20. ♂.
- xenus** Rozen. Wash., Calif. (Lake Tahoe). Pollen: Pollen-laden females have been collected from the flowers of *Phacelia*.  
*Nomadopsis xenus* Rozen, 1958. Calif. Univ. Pubs. Ent. 15: 167, figs. 209-213. ♂, ♀.

### Genus CALLIOPSIS Smith

- Revision: Shinn, 1967. Kans. Univ. Sci. Bul. 46: 753-936, 156 figs., 8 maps, 9 tables (N. and Cent. Amer. spp., includes biological information).
- Taxonomy: Cockerell, 1898. Amer. Ent. Soc., Trans. 25: 195-198 (U. S. spp.). — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 287-293, figs. 58, 69-71, table 8 (eastern U. S. spp.). — Rozen, 1966. Amer. Mus. Novitates 2259: 5, 13-16, figs. 29-40 (larvae). — Yager and Rozen, 1966. Amer. Mus. Novitates 2265: 8-10, figs. 11-12 (pupae).
- Biology: Rozen, 1967. Amer. Mus. Novitates 2297: 1-44, 18 figs., 2 tables (review).

### Genus CALLIOPSIS Subgenus CALLIOPSIS Smith

- Calliopsis* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 128.
- Type-species: *Calliopsis andreniformis* Smith. Desig. by Ashmead, 1899.
- Taxonomy: Shinn, 1967. Kans. Univ. Sci. Bul. 46: 782-816, figs. 5, 6, 8-45, maps 1-3 (redescription, included spp.).
- andreniformis** Smith. Southeast. Canada including the Maritime Provinces, south to Fla., west to Mont., S. Dak., Colo., Utah, Okla. and east Tex. Parasite: *Holcopasites calliopsidis* (Linsley), *H. illinoiensis* (Robertson), *Sphecodes brachycephalus* Mitchell?, *Sphecodes* sp., *Parabomblyx coquillettii* (Will.)?, *Trochometridium tribulatum* Cross, *Villa*

*sinuosa* (Wied.). Pollen: Polylectic, known sources include *Aster ericoides villosus*, *Convolvulus*, *Desmodium marilandicum*, *D. paniculatum*, *Erigeron canadensis*, *Gerardia tenuifolia*, *Hedyotis purpurea*, *Lippia lanceolata*, *Lycopus sinuatus*, *Lythrum alatum*, *Malva neglecta*, *M. rotundifolia*, *Melilotus alba*, *M. officinalis*, *Oxalis stricta*, *Polygala sanguinea*, *Polygonum buxiforme*, *Psoralea onybrichis*, *Pycnanthemum pilosum*, *Trifolium pratense*, *T. procumbens*, *T. repens*, *Verbena bracteata*, *V. hastata*, *V. urticifolia*, *Verbesina helianthoides*, but visits these and other flowers for nectar including *Achillea*, *Alanthus altissima*, *Ammania coccinea*, *Amorpha canescens*, *Anaphalis margaritacea*, *Asclepias*, *Bidens aristosa*, *Boltonia asteroides*, *Brassica*, *Castanea pumila*, *Ceanothus americanus*, *Chrysanthemum leucanthemum*, *Chrysopsis*, *Cleome*, *Coreopsis palmata*, *C. tripteris*, *Cryptotaenia canadensis*, *Cucumis*, *Dianthera americana*, *Epilobium*, *Eryngium yuccifolium*, *Geum album*, *Gillenia stipulacea*, *Hedeoma pulegioides*, *Hedyotis nigricans*, *Helenium*, *Hypericum perforatum*, *Lindernia dubia riparia*, *Lespedeza capitata*, *L. procumbens*, *L. repens*, *L. reticulata*, *Ligustrum*, *Medicago sativa*, *Nepeta cataria*, *Oenothera laciniata*, *Oxalis dillenii*, *Penstemon*, *Petalostemon candidum*, *Polygonum convolvulus*, *P. pennsylvanicum*, *Portulaca*, *Potentilla monspeliensis*, *P. recta*, *Prunella vulgaris*, *Prunus*, *Psoralea tenuiflora*, *P. tenuiflora floribunda*, *Pycnanthemum flexuosum*, *P. virginianum*, *P. lanceolatum*, *Raphanus sativus*, *Rhus glabra*, *Rosa*, *Rubus*, *Rudbeckia triloba*, *Serinea oppositifolia*, *Sisymbrium repandum*, *Solanum carolinense*, *Solidago canadensis*, *Spiranthes gracilis*, *Stachys palustris*, *Stellaria*, *Strophostyles pauciflora*, *Stylosanthes biflora*, *Symphoricarpos*, *Tamarix*, *Trifolium hybridum*, *Verbena bracteosa*, *Veronica spicata*, *Vicia*. Predator: *Philaanthus gibbosus* (Fabr.), *P. politus* Say.

*Calliopsis andreniformis* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 128. ♀.

*Calliopsis flavipes* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 128. ♂.

*Calliopsis lepidus* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 68. ♀.

*Panurgus vernalis* Provancher, 1882. Nat. Canad. 13: 204. ♀, ♂.

Taxonomy: Michener, 1953. Kans. Univ. Sci. Bul. 35: 1038, figs. 100-105 (larva). — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 288-289, figs. 69-71, table 8 (redescription, synonymy). — Rozen, 1966. Amer. Mus. Novitates 2259: 16, fig. 40 (larva). — Yager and Rozen, 1966. Amer. Mus. Novitates 2265: 8-10, figs. 11-12 (pupa). — Shinn, 1967. Kans. Univ. Sci. Bul. 46: 786-791, figs. 5-6, 8-13, map 1 (redescription).

Biology: Graenicher, 1905. Wis. Nat. Hist. Soc., Bul. 3: 159 (nest). — Swenk, 1907. Ent. News 18: 297 (nest, parasite). — Reinhard, 1924. Ann. Rept. Smithsn. Inst. 2738: 371-373 (predator). — Robertson, 1926. Psyche 33: 118 (nest, parasite). — Hendrickson, 1930. Iowa State Coll. Jour. Sci. 4: 163 (nest). — Pearson, 1933. Ecol. Monog. 3: 387 409-411 (floral relationships). — Ainslie, 1937. Canad. Ent. 69: 97-100 (nest, floral relationships, parasite). — Lovell and Lovell, 1939. Rhodora 41: 185 (ecology). — Crandall and Tate, 1947. Amer. Soc. Agronomy, Jour. 39: 161-163 (nest site, floral relationships). — Mitchell, 1956. Elisha Mitchell Sci. Soc. 72: 207 (parasite). — Michener and Rettenmeyer, 1956. Kans. Univ. Sci. Bul. 37: 645 (age of nest site). — Montgomery, 1957. Ind. Acad. Sci., Proc. 66: 129 (ecology). — Byers, 1962. Kans. Ent. Soc., Jour. 35: 320 (ecology). — Rozen, 1966. Amer. Mus. Novitates 2244: 33 (parasite). — Shinn, 1967. Kans. Univ. Sci. Bul. 46: 895-935 figs. 144-156, tables 4-9 (nest architecture, life history, immature stages, odor production, sleep, floral relationships, parasites). — Rozen, 1967. Amer. Mus. Novitates 2297: 32-33, fig. 9, table 1 (nest architecture, life history, parasite). — Hurd and Linsley, 1972. Smithsn. Contrib. Zool. 114: 39, table 1 (parasites).

*empelia* Shinn. Ariz. (Douglas and Mt. Lemmon).

*Calliopsis (Calliopsis) empelia* Shinn, 1967. Kans. Univ. Sci. Bul. 46: 811, figs. 38-41, map 2. ♀, ♂.

*helenae* Shinn. Tex. (10 mi. s. Alice); Mexico (Piedras Negras, Coahuila).

*Calliopsis (Calliopsis) helenae* Shinn, 1967. Kans. Univ. Sci. Bul. 46: 814, map 1. ♀.

*hondurasica* Cockerell. La. (Robson), Tex.; Mexico to Panama. Pollen: Unknown, but visits flowers of *Cassia*, *Kallstroemia hirsutissima*, *Lippia*, *Nama undulatum*, *Phyla strigosa*, *Teucrium*, *Trifolium repens*, *Verbena*.

*Calliopsis hondurasica* Cockerell, 1949. U. S. Natl. Mus., Proc. 98: 437. ♀.

Taxonomy: Shinn, 1967. Kans. Univ. Sci. Bul. 46: 800-804, figs. 30-33, map 2 (redescription).

**rhodophila** Cockerell. N. Mex., Ariz. (Chino Valley), south. Calif. (Riverside, San Bernardino and San Diego Counties); Mexico (Durango and Zacatecas). Pollen: Unknown, but visits flowers of *Solidago*, *Sphaeralcea*.

*Calliopsis andreniformis rhodophilus* Cockerell, 1897. Acad. Nat. Sci. Phila., Proc. 49: 350. ♂, ♀.

Taxonomy: Shinn, 1967. Kans. Univ. Sci. Bul. 46: 796-799, figs. 22-25, map 1 (redescription).

**squamifera** Timberlake. Ariz. Pollen: Unknown, but visits flowers of *Baccharis glutinosa*, *Euphorbia*, *Medicago sativa*.

*Calliopsis squamifera* Timberlake, 1947. Pan-Pacific Ent. 23: 28. ♂.

Taxonomy: Shinn, 1967. Kans. Univ. Sci. Bul. 46: 804-807, figs. 42-45, map 3 (redescription).

**teucarii** Cockerell. N. Mex., Ariz., Colo.; Mexico (Distrito Federal, Durango, Guerrero, Mexico, Michoacan, Morelos, Nuevo Leon, Oaxaca, Puebla, Queretaro, San Luis Potosi, Tlaxcala and Zacatecas). Pollen: Unknown, but visits flowers of *Asclepias*, *Convolvulus incanus*, *Heterotheca chrysopsidis*, *Melilotus officinalis*, *Oralis*, *Potentilla*, *Stylosanthes*, *Taraxacum*, *Teucrium laciniatum*.

*Calliopsis teucarii* Cockerell, 1899. In Cockerell and Porter, Ann. and Mag. Nat. Hist. (7) 4: 412. ♀.

### Genus CALLIOPSIS Subgenus PERISSANDER Michener

*Calliopsis* subg. *Perissander* Michener, 1942. N. Y. Ent. Soc., Jour. 50: 275.

Type-species: *Calliopsis (Perissander) anomoptera* Michener. Monotypic and orig. desig.

Taxonomy: Shinn, 1967. Kans. Univ. Sci. Bul. 46: 816-834, figs. 7, 46-57, maps 3-4 (redescription, included spp.).

**anomoptera** Michener. East. N. Mex., west to south. Calif.; Mexico (Baja California and Sonora). Pollen: Polylectic, collects pollen and nectar from a variety of flowers including *Cladothrix lanuginosa*, *Eriogonum*, *Euphorbia albomarginata*, *E. capitellata*, *E. hirtella*, *E. pleniradiata*, *E. polycarpa hirtella*, *E. polycarpa typica*, *Lepidium thurberi*, *Tidestromia*.

*Calliopsis (Perissander) anomoptera* Michener, 1942. N. Y. Ent. Soc., Jour. 50: 275. ♂, ♀.

Taxonomy: Shinn, 1967. Kans. Univ. Sci. Bul. 46: 818-823, figs. 7, 46-49, map 4 (redescription).

Biology: Krombein, 1961. Ent. News 72: 82-83 (floral relationships with *Euphorbia albomarginata*). —Shinn, 1967. Kans. Univ. Sci. Bul. 46: 823 (floral relationships).

**fulgida** Shinn. N. Mex. (4.8 mi. N. of Rodeo), Ariz. (5 mi. E. Portal). Pollen: Unknown, but visits flowers of *Euphorbia*, *Tidestromia lanuginosa*.

*Calliopsis (Perissander) fulgida* Shinn, 1967. Kans. Univ. Sci. Bul. 46: 831, map 3 ♀.

**gilva** Shinn. Ariz. (Douglas and Pima Counties), N. Mex. (Hidalgo County). Pollen: Unknown, but visits flowers of *Euphorbia*, *Verbesina*, *Tidestromia lanuginosa*.

*Calliopsis (Perissander) gilva* Shinn, 1967. Kans. Univ. Sci. Bul. 46: 829, figs. 54-57, map 4. ♀, ♂.

**limbus** Shinn. Ariz. (Santa Catalina Mts.), N. Mex. (Granite Pass). Pollen: Unknown, but visits flowers of *Euphorbia*.

*Calliopsis (Perissander) limbus* Shinn, 1967. Kans. Univ. Sci. Bul. 46: 827, map 4. ♀, ♂.

**rogeri** Shinn. Ariz. (Cochise County). Pollen: Unknown, but visits flowers of *Euphorbia albomarginata*, *Lepidium thurberi*.

*Calliopsis (Perissander) rogeri* Shinn, 1967. Kans. Univ. Sci. Bul. 46: 823, figs. 50-53, map 4. ♀, ♂.

### Genus CALLIOPSIS Subgenus CALLIOPSIMA Shinn

*Calliopsis* subg. *Calliopsima* Shinn, 1967. Kans. Univ. Sci. Bul. 46: 834.

Type-species: *Calliopsis rozeni* Shinn. Orig. desig.



**bernardinensis** Michener. South. Calif. (Riverside and San Bernardino Counties). Pollen:

Apparently an oligolege of autumnal flowering Compositae including *Gutierrezia sarothrae*, *Heterotheca grandiflora*, *Senecio ionophyllus*.

*Calliopsis bernardinensis* Michener, 1937. Ann. and Mag. Nat. Hist. (10) 19: 323. ♂, ♀.

Taxonomy: Shinn, 1967. Kans. Univ. Sci. Bul. 46: 852-855, figs. 77-82, map 6 (redescription, floral records).

**chlorops** Cockerell. N. Mex., Colo., Wyo., Idaho, Utah, Nev., Ariz. Pollen: Apparently an oligolege of the Compositae; visits flowers of *Chrysopsis*, *Grindelia squarrosa*, *Haplopappus gracilis*, *Medicago sativa*, *Ratibida*, *Verbesina*, *Viguiera annua*.

*Calliopsis chlorops* Cockerell, 1899. In Cockerell and Porter, Ann. and Mag. Nat. Hist. (7) 4: 413. ♂.

Taxonomy: Shinn, 1967. Kans. Univ. Sci. Bul. 46: 860-862, figs. 95-98, map 6 (redescription, floral records).

**coloradensis** Cresson. Alta. to south. Utah and south. N. Mex., east to Mississippi River, thence through east. Tex. and Gulf States to east slope of the Appalachian Mts. in N. C. Parasite: *Holcopasites arizonicus* (Linsley). Pollen: Apparently an oligolege of the Astereae and Heliantheae (Compositae); collects pollen from the flowers of *Bidens aristosa*, *Boltonia asteroides*, *Coreopsis tripteris*, *Rudbeckia triloba*, *Solidago canadensis*, but visits other flowers some of which may also serve as pollen sources including *Anthemis cotula*, *Aplopappus pluriflorus*, *Aster dumosus*, *A. praetius*, *Bidens laevis*, *Chrysopsis*, *Chrysanthamnus nauseosus*, *Eriocarpum gracile*, *Grindelia perennis*, *G. squarrosa*, *Haplopappus*, *Helenium nudiflorum*, *Heterotheca subaxillaris*, *Macrotera*, *Silphium*, *Solidago rigida*, *S. serotina*.

*Calliopsis coloradensis* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 63. ♀, ♂.

*Calliopsis coloratipes fedorensis* Cockerell, 1909. Ann. and Mag. Nat. Hist. (8) 4: 28. ♀.

Taxonomy: Cockerell, 1908. Canad. Ent. 40: 147. ♂. —Timberlake, 1951. In Muesebeck, Krombein and Townes, U. S. Dept. Agr., Agr. Monog. 2: 1103 (synonymy). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 289-290, figs. 69-71 (redescription, floral records). —Shinn, 1967. Kans. Univ. Sci. Bul. 46: 841-846, figs. 63-66, map 5, tables 2, 3 (redescription).

Biology: Hicks, 1926. Colo. Univ., Studies 15: 223 (nest). —Robertson, 1922. Psyche 29: 169 (floral relationships). —Shinn, 1967. Kans. Univ. Sci. Bul. 46: 846 (floral relationships). —Hurd and Linsley, 1972. Smithsn. Contrib. Zool. 114: 39, table 1 (parasite).

**coloratipes** Cockerell. N. Mex., Ariz., Utah, Nev. Pollen: Unknown, but visits flowers of *Asclepias subverticillata*, *Bigelovia hartwegii*, *B. wrightii*, *Chrysanthamnus nauseosus consimilis*, *Heterotheca*.

*Calliopsis flavifrons* race *coloratipes* Cockerell, 1898. Denison Univ. Sci. Labs., Bul. 11: 52. ♂.

Taxonomy: Cockerell, 1898. Univ. N. Mex., Bul. 1: 52. ♂. —Cockerell, 1899. Entomologist 33: 64. ♀. —Shinn, 1967. Kans. Univ. Sci. Bul. 46: 862-865, figs. 99-102, map 5 (redescription, floral records).

**crypta** Shinn. Ariz. (Chiricahua Mts.); Mexico (Chihuahua). Parasite: *Holcopasites stevensi* (Cwfd.). Pollen: Collects pollen from *Heterotheca subaxillaris*, but also visits the flowers of *Cirsium*, *Helianthus*.

*Calliopsis crypta* Shinn, 1965. Amer. Mus. Novitates 2211: 15, figs. 9-12. ♀, ♂.

Taxonomy: Rozen, 1966. Amer. Mus. Novitates 2259: 14, figs. 29-33 (larva). —Shinn, 1967. Kans. Univ. Sci. Bul. 46: 858-860, figs. 87-90, map 6 (redescription).

Biology: Rozen, 1967. Amer. Mus. Novitates 2297: 30-31, fig. 10, tables 1-2 (nest architecture, life history, floral relationship, parasite). —Hurd and Linsley, 1972. Smithsn. Contrib. Zool. 114: 39, table 1 (parasite).

**deserticola** Shinn. South. Calif., deserts. Pollen: Unknown, but visits flowers of *Encelia farinosa*.

*Calliopsis (Calliopsis) deserticola* Shinn, 1967. Kans. Univ. Sci. Bul. 46: 865, figs. 103-106, map 5. ♀, ♂.

- pectidis** Shinn. west. N. Mex., Ariz., south. Calif.; Mexico (Baja California). Parasite: *Holcospites arizonicus* (Linsley)? Pollen: Unknown, but visits flowers of *Apolappus*, *Baccharis*, *Baileya pleniradiata*, *Helianthus*, *Heterotheca subaxillaris*, *Hymenothrix wislizeni*, *Melilotus alba*, *Pectis angustifolia*, *P. papposa*, *Tidestromia lanuginosa*, *Verbesina encelioides*.  
*Calliopsis pectidis* Shinn, 1965. Amer. Mus. Novitates 2211: 10, figs. 5-8. ♀, ♂.  
 Taxonomy: Shinn, 1967. Kans. Univ. Sci. Bul. 46: 846-850, figs. 67-71, map 6 (redescription).  
 Biology: Shinn, 1965. Amer. Mus. Novitates 2211: 15 (parasite). — Shinn, 1967. Kans. Univ. Sci. Bul. 46: 850, 920 (floral records, parasite). — Hurd and Linsley, 1972. Smithsn. Contrib. Zool. 114: 39, table 1 (parasite).
- pugionis** Cockerell. South. Calif. (cismontane). Pollen: Apparently an oligolege of Compositae, visits flowers of *Chaenactis artemisiaefolia*, *C. glabriuscula*, *Coreopsis* (cultivated), *C. lanceolata*, *Encelia farinosa*, *Hemizonia wrightii*, *Oenothera veitchiana*.  
*Calliopsis pugionis* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 197. ♀.  
 Taxonomy: Shinn, 1967. Kans. Univ. Sci. Bul. 46: 868-870, figs. 107-110, map 5 (redescription).
- rozeni** Shinn. Tex., N. Mex., Ariz.; Mexico (Chihuahua and Coahuila). Parasite: *Holcospites stevensi* (Cwfd.)? Pollen: Collects pollen from *Heterotheca subaxillaris* primarily, but visits other flowers including *Baccharis*, *Baileya pleniradiata*, *Chamaesaracha conoides*, *Eriogonum gracile*, *Gaillardia*, *Helianthus*, *Hymenoxys odorata*, *Melilotus alba*, *Parkinsonia*, *Pectis papposa*, *Psilostrophe cooperi*, *Sphaeralcea emoryi*, *Verbesina exauria*.  
*Calliopsis rozeni* Shinn, 1965. Amer. Mus. Novitates 2211: 2, figs. 1-4. ♀, ♂.  
 Taxonomy: Rozen, 1966. Amer. Mus. Novitates 2259: 14-16, figs. 34-39 (larva, as *rozeni*?). — Shinn, 1967. Kans. Univ. Sci. Bul. 46: 838-841, figs. 58-62, map 5 (redescription).  
 Biology: Rozen, 1965. N. Y. Ent. Soc., Jour. 73: 88 (parasite). — Rozen, 1967. Amer. Mus. Novitates 2297: 31-32, tables 1-2 (nest architecture, life history, floral relationships, parasite). — Hurd and Linsley, 1972. Smithsn. Contrib. Zool. 114: 39, table 1 (parasite).
- timberlakei** Shinn. West. Tex., N. Mex., Ariz., Utah. Pollen: Apparently an oligolege of Compositae, visits flowers of *Bahia absinthifolia*, *Bigelovia*, *Chrysothamnus nauseosus*, *Gutierrezia longifolia*, *G. microcephala*, *G. sarothrae*, *Haplopappus spinulosus*, *H. wrightii*.  
*Calliopsis (Calliopsima) timberlakei* Shinn, 1967. Kans. Univ. Sci. Bul. 46: 850, figs. 72-76, map 7. ♀, ♂.
- unca** Shinn. N. Mex. (3 mi. W. Bingham). Pollen: Unknown, but visits flowers of *Baileya pleniradiata*.  
*Calliopsis (Calliopsima) unca* Shinn, 1967. Kans. Univ. Sci. Bul. 46: 855, figs. 83-86, map 7. ♂.

#### Genus CALLIOPSIS Subgenus VERBENAPIS Cockerell and Atkins

- Calliopsis* subg. *Verbenapis* Cockerell and Atkins, 1902. Ann. and Mag. Nat. Hist. (7) 10: 44.  
 Type-species: *Calliopsis verbenae* Cockerell and Porter. Monotypic.  
 Taxonomy: Shinn, 1967. Kans. Univ. Sci. Bul. 46: 876-891, figs. 123-143, map 8 (redescription, included spp.).
- hirsutifrons** Cockerell. West. Tex. (El Paso), N. Mex.; Mexico (Chihuahua, Guanajuato, Hidalgo and Mexico).  
*Calliopsis hirsutifrons* Cockerell, 1896. Canad. Ent. 28: 158. ♂.  
 Taxonomy: Shinn, 1967. Kans. Univ. Sci. Bul. 46: 887-889, figs. 134-138. ♀, ♂ (redescription).
- micheneri** Shinn. Tex. (Carrizo Springs). Pollen: Unknown, but visits flowers of *Verbena cloveri*.  
*Calliopsis (Verbenapis) micheneri* Shinn, 1967. Kans. Univ. Sci. Bul. 46: 889, figs. 139-143, map 8. ♀, ♂.

**nebraskensis** Crawford. N. J., Wis. west to N. Dak., S. Dak., Nebr., Colo., south to Ill., Ark. and Kans. Parasite: *Holcopasites heliopsis* (Robt.), *Sphecodes* sp.? Pollen: Apparently polylectic since mixed pollen loads from flowers of Leguminosae and Verbenaceae have been observed; visitation records include flowers of *Ambrosia*, *Asclepias*, *Medicago sativa*, *Verbena hastata*, *V. stricta*, *V. urticaefolia*, *Vernonia*.  
*Calliopsis verbenae* var. *Nebraskensis* Crawford, 1902. Canad. Ent. 34: 240. ♀, ♂.

Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 291-292, figs. 69-71, table 8 (redescription). — Shinn, 1967. Kans. Univ. Sci. Bul. 46: 882-887, figs. 129-133, map 8 (redescription).

Biology: Robertson, 1914. Ent. News 25: 72 (floral relationships, as *verbenae*). — Rau and Rau, 1916. Jour. Anim. Behavior 6: 368 (nesting habits, mating). — Robertson, 1922. Psyche 29: 171 (floral relationships, as *verbenae*). — Rau, 1922. Acad. Sci. St. Louis, Trans. 24 (7): 33 (nesting habits, mating behavior, parasite). — Shinn, 1967. Kans. Univ. Sci. Bul. 46: 886-887 (summary of bionomics including floral relationships). — Hurd and Linsley, 1972. Smithsn. Contrib. Zool. 114: 39, table 1 (parasite).

**verbenae** Cockerell and Porter. West. Tex. to southeast. Ariz.; Mexico (Durango). Pollen: Unknown, but visits flowers of *Chamaesaracha conoides*, *Sphaeralcea lobata*, *Verbena bipinnatifida*, *V. macdougalii*.

*Calliopsis verbenae* Cockerell and Porter, 1899. Ann. and Mag. Nat. Hist. (7) 4: 412. ♀, ♂.

Taxonomy: Shinn, 1967. Kans. Univ. Sci. Bul. 46: 878-881, figs. 123-128, map 8 (tax. status, redescription, flower records).

#### NOMEN NUDUM IN CALLIOPSIS SMITH

*Calliopsis bridwelli* Bridwell, 1899. Kans. Acad. Sci., Trans. 16: 210.

#### UNPLACED TAXON IN CALLIOPSIS SMITH

**flavifrons** Smith. Va., Fla.

*Calliopsis flavifrons* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 129. ♂.

Taxonomy: Cockerell, 1905. Amer. Ent. Soc., Trans. 31: 321. ♀. — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 293 (tax. status). — Shinn, 1967. Kans. Univ. Sci. Bul. 46: 892 (tax. status).

### Genus HYPOMACROTERA Cockerell and Porter

*Hypomacrotera* Cockerell and Porter, 1899. Ann. and Mag. Nat. Hist. (7) 4: 418.

Type-species: *Hypomacrotera callops* Cockerell and Porter. Orig. desig.

Biology: Rozen, 1970. Amer. Mus. Novitates 2416: 1-16, 19 figs., table 1 (nest architecture, life history, mating habits, immature stages, nest associates).

**callops** Cockerell and Porter. Colo., N. Mex., Ariz. Parasite: *Holcopasites illinoiensis minimus* (Linsley)? Pollen: Collects pollen from the flowers of *Sphaeralcea*.

*Hypomacrotera callops* Cockerell and Porter, 1899. Ann. and Mag. Nat. Hist. (7) 4: 419. ♂, ♀.

Taxonomy: Cockerell, 1937. Amer. Mus. Novitates 948: 3. — Rozen, 1970. Amer. Mus. Novitates 2416: 7-9, 15-16, figs. 3-8, 18-19 (larva, pupa).

Biology: Rozen, 1970. Amer. Mus. Novitates 2416: 2-5, table, 1 (nest architecture, nesting habits, pollen source). — Hurd and Linsley, 1972. Smithsn. Contrib. Zool. 114: 36, table 1 (parasite).

**callops persimilis** Cockerell. Ariz., south. Calif.; Mexico (Baja California and Sonora). Parasite: *Holcopasites illinoiensis minimus* (Linsley). Pollen: Collects pollen from the flowers of *Physalis*, but visits other flowers for nectar including *Melilotus alba*, *Sida hederacea*.

*Hypomacrotera callops persimilis* Cockerell, 1899. Entomologist 33: 64. ♀, ♂.

Biology: Hurd and Linsley, 1972. Smithsn. Contrib. Zool. 114: 36, table 1 (parasite).

**subalpinus andradensis** Cockerell. N. Mex. to south. Calif.; Mexico (Baja California and Sonora). Pollen: Collects pollen from the flowers of *Sphaeralcea* including *S. ambigua*, *S.*

*angustifolia*, *S. emoryi*, *S. orcutti*, but visits other flowers for nectar including *Baileya multiradiata*, *B. pleniradiata*.

*Hypomacrotera andradensis* Cockerell, 1937. Amer. Mus. Novitates 948: 3. ♀, ♂.

**subalpinus** (Cockerell). N. Mex., Ariz.; Mexico (Sonora). Parasite: *Oreopasites* sp.

Pollen: Collects pollen from the flowers of *Sphaeralcea* including *S. ambigua*, *S. orcutti*.

*Calliopsis subalpinus* Cockerell, 1894. Ent. News 5: 235. ♂.

*Calliopsis semirufus* Cockerell, 1896. Ent. Monthly Mag. 32: 219. ♀.

Biology: Rozen, 1970. Amer. Mus. Novitates 2416: 2-5, table 1 (nest architecture, nesting habits, pollen source, parasite).

### Genus XENOPANURGUS Michener

*Xenopanurgus* Michener, 1952. Kans. Ent. Soc., Jour. 25: 24.

Type-species: *Xenopanurgus readioi* Michener. Orig. desig.

Taxonomy: Shinn, 1964. Ent. News 75: 73-78 (included sp.).

**readioi** Michener. Ariz. (Huachuca Mts.); Mexico (Toluca).

*Xenopanurgus readioi* Michener, 1952. Kans. Ent. Soc., Jour. 25: 25, 5 figs. ♂.

Taxonomy: Shinn, 1964. Ent. News 75: 74-78. ♀, ♂.

### Genus PERDITA Smith

This is a very large genus of pollen-collecting bees that has established through its component species a predominantly oligolectic relationship with the flora of North America. Even though the genus occurs transcontinentally in southern Canada, the United States and Mexico to as far south as Central America (Guatemala), it is centered in the more arid areas of northern Mexico and adjacent southwestern United States. The nesting habits of only a few species have been studied and these, like other species of the family, make their nests in the ground, although one species, *Perdita* (*Cockerellula*) *opuntiae* Cockerell, is known to excavate its nests in sandstone. Several females of at least some species occupy a single nest, but there is no evidence of caste development.

In recognition of utilitarian advantages, the subgenera are arranged alphabetically in this catalog.

Revision: Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 25-107. —Cockerell, 1922. Amer.

Mus. Novitates 33: 14 (partial key). —Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 345-432, 172 figs. (all subgenera except *Hexaperdita* Timberlake, *Perditella* Cockerell, *Alloperdita* Viereck, and typical *Perdita* Smith). —Timberlake, 1956. Calif. Univ. Pubs. Ent. 11:

247-350, figs. 173-367 (treats subgenera *Alloperdita* Viereck, *Perditella* Cockerell, *Hexaperdita* Timberlake, and *Pygoperdita* Timberlake). —Timberlake, 1958. Calif. Univ.

Pubs. Ent. 14: 303-410, figs. 368-521 (treats *zonalis* and *halictoides* groups of subgenus *Perdita*). —Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 1-156, figs., 522-732 (treats *octomaculata* group of subgenus *Perdita*). —Timberlake, 1962. Calif. Univ. Pubs. Ent. 28:

1-124, figs. 733-904, 2 text figs. (treats *ventralis* group of subgenus *Perdita*, and suppl. to Parts I-IV). —Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 125-388, figs. 905-1190, 77 text figs. (treats *sphaeralceae* group of subgenus *Perdita*). —Timberlake, 1968. Calif. Univ.

Pubs. Ent. 49: 1-196, figs. 1191-1360, 31 text figs. (suppl. to preceding parts, bibliography, index to Parts I-VII, corrigenda). —Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 1-63, figs. 1361-1417 (suppl. to Parts I-VII, treats subgenera *Cockerellia*, *Epimacrotera*, *Hexaperdita*, *Pentaperdita*, *Perdita*, *Prococckerellia*, *Pygoperdita*, *Xeromacrotera*).

Taxonomy: Cockerell, 1922. Amer. Mus. Novitates 33: 1-15 (west. U. S. spp., species formation). —Timberlake, 1952. Ent. Soc. Wash., Proc. 54: 199-204 (eastern U. S. spp.).

—Timberlake, 1953. Kans. Univ. Sci. Bul. 35: 961-985 (treats spp. of the subgenera *Cockerellia*, *Cockerellula*, *Macroteropsis*, *Xerophasma*). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 295-330, figs. 58, 72-79, table 9 (eastern U. S. spp.). —Rozen, 1966.

Amer. Mus. Novitates 2259: 5, 16-21, figs. 41-54 (larvae). —Yager and Rozen, 1966. Amer. Mus. Novitates 2265: 12 (pupae).

Biology: Linsley, 1958. *Hilgardia* 27: 562, tables 4, 5 (pollen sources of some subgenera).  
 —Rozen, 1967. *Amer. Mus. Novitates* 2297: 1-44, 18 figs., 2 tables (review). —Hurd and Linsley, 1975. *Smithsn. Contrib. Zool.* 193: 24-26, figs. 5-7 (*Larrea* visiting spp.).

### Genus PERDITA Subgenus ALLOMACROTERA Timberlake

*Perdita* subg. *Allomacrotera* Timberlake, 1960. *Calif. Univ. Pubs. Ent.* 17: 131.

Type-species: *Perdita stephanomeriae* Timberlake. Monotypic and orig. desig.

Taxonomy: Timberlake, 1971. *Calif. Univ. Pubs. Ent.* 66: 5-6 (key to spp. of subgenera *Allomacrotera*, *Procockerellia*).

**stephanomeriae** Timberlake. *Calif. (Colorado and Mojave Deserts)*. Pollen: Possibly an oligolege of *Stephanomeria* including *S. pauciflora*, a male has been collected at the flowers of *Dalea spinosa*.

*Perdita stephanomeriae* Timberlake, 1954. *Calif. Univ. Pubs. Ent.* 9: 404. ♀.

Taxonomy: Timberlake, 1960. *Calif. Univ. Pubs. Ent.* 60: 131-132, figs. 658, 659, 731. ♂.

### Genus PERDITA Subgenus ALLOPERDITA Viereck

*Perdita* subg. *Alloperdita* Viereck, 1917. *Amer. Mus. Nat. Hist., Bul.* 37: 241.

Type-species: *Perdita novae-angliae* Viereck. Monotypic.

Taxonomy: Timberlake, 1954. *Calif. Univ. Pubs. Ent.* 9: 348 (key). —Timberlake, 1956. *Calif. Univ. Pubs. Ent.* 11: 271-275 (redescription, key to spp.). —Timberlake, 1958. *Calif. Univ. Pubs. Ent.* 14: 393 (modification of key). —Timberlake, 1960. *Calif. Univ. Pubs. Ent.* 17: 134. —Timberlake, 1968. *Calif. Univ. Pubs. Ent.* 49: 30.

**bradleyi** Viereck. N. J. to Fla. Pollen: Unknown, but visits flowers of *Batodendron*, *Crataegus*, *Hydrocotyle umbellatum*, *Ilex*, *Nyssa sylvatica*, *Pyracantha*, *Sarracenia flava*.

*Perdita bradleyi* Viereck, 1907. *Ent. News* 18: 393. ♂.

Taxonomy: Timberlake, 1928. *Amer. Mus. Novitates* 321: 7 (as *obscurata*). —Timberlake, 1956. *Calif. Univ. Pubs. Ent.* 11: 274, figs. 211, 212, 306 (as *obscurata*). —Timberlake, 1958. *Calif. Univ. Pubs. Ent.* 14: 394 (as *obscurata*). —Timberlake, 1960. *Calif. Univ. Pubs. Ent.* 17: 134 (type). —Mitchell, 1964. *N. C. Agr. Expt. Sta. Tech. Bul.* 141: 310-311, figs. 72-73, table 9 (redescription).

**floridensis** Timberlake. N. C. to Fla. Pollen: Unknown, but visits flowers of *Batodendron*, *Ilex glabra*, *Leucothoe*.

*Perdita floridensis* Timberlake, 1928. *Amer. Mus. Novitates* 321: 7. ♂, ♀.

Taxonomy: Timberlake, 1956. *Calif. Univ. Pubs. Ent.* 11: 273, 274 (key, geogr. records).

—Timberlake, 1958. *Calif. Univ. Pubs. Ent.* 14: 393 (key). —Mitchell, 1960. *N. C. Agr.*

*Expt. Sta. Tech. Bul.* 141: 311, figs. 72-74, 79, table 9 (redescription).

**gertschi** Timberlake. Tex. (Brewster County); Mexico (Coahuila). Pollen: Unknown, but visits flowers of *Prosopis juliflora*.

*Perdita (Alloperdita) gertschi* Timberlake, 1958. *Calif. Univ. Pubs. Ent.* 14: 393, figs. 468, 469, 519. ♂.

Taxonomy: Timberlake, 1968. *Calif. Univ. Pubs. Ent.* 49: 30-31. ♀.

**mitchelli** Timberlake. N. C., Fla., Ala., Miss. Pollen: Unknown, but visits flowers of *Ceanothus*, *Cyrtilla racemiflora*, *Oxydendrum*.

*Perdita mitchelli* Timberlake, 1947. *Ent. Soc. Wash., Proc.* 49: 81. ♀, ♂.

Taxonomy: Timberlake, 1956. *Calif. Univ. Pubs. Ent.* 11: 273, 274, figs. 213-214, 307 (key, geogr. records). —Mitchell, 1960. *N. C. Agr. Expt. Sta. Tech. Bul.* 141: 311-312, figs. 73-74, table 9 (redescription).

**novaeangliae** Viereck. Mass. to Fla. Pollen: Unknown, but visits flowers of *Batodendron*, huckleberry, *Lyonia ligustrina*.

*Perdita novae-angliae* Viereck, 1907. *Ent. News* 18: 394. ♀, ♂.

*Perdita novaeangliae* Viereck, 1917. *Amer. Mus. Nat. Hist., Bul.* 37: 241. Emend.

Taxonomy: Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 273, 274, 275, figs. 219, 220, 310 (key, genitalia). —Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 393 (key). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 312-313, figs. 72-73, table 9 (redescription).

**obscurata** Cresson. N. C. to Tex. Parasite: *Neolarra cockerelli* (Cwfd.)? Pollen: Unknown, but visits flowers of *Batodendron*, *Diospyros virginiana*, *Stillingia sylvatica*.

*Perdita obscurata* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 70. ♀, ♂.

*Perdita carolina* Timberlake, 1952. Ent. Soc. Wash., Proc. 54: 199. ♀, ♂.

Taxonomy: Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 273, 274, figs. 215, 216, 308 (key, genitalia, geogr. and floral records, as *carolina*). —Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 134 (synonymy). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 313-314, figs. 72-74, 79, table 9 (synonymy, redescription).

**townesi** Timberlake. N. C. to Fla. Pollen: Unknown, but visits flowers of *Batodendron*, *Ceanothus microphyllus*, *Diospyros virginiana*, *Ilex*, *Nyssa sylvatica*.

*Perdita townesi* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 31, figs. 1209-1210, 1308. ♂, ♀.

### Genus PERDITA Subgenus COCKERELLIA Ashmead

*Cockerellia* Ashmead, 1898. Psyche 8: 284.

Type-species: *Perdita albipennis* Cresson. Monotypic and orig. desig.  
(=*Perdita hyalina* Cresson).

*Philozanthus* Ashmead, 1898. Psyche 8: 285.

Type-species: *Perdita beata* Cockerell. Monotypic and orig. desig.

The species of this subgenus are found almost exclusively at flowers of Compositae, mostly of the genera *Baileya*, *Coreopsis*, *Gaillardia*, *Geraea*, *Helianthus*, *Ratibida*, *Rudbeckia* and *Verbesina*, but also occur at the flowers of *Erigeron*, *Heterotheca*, *Pectis* and *Prionopsis*.

Taxonomy: Timberlake, 1953. Kans. Univ. Sci. Bul. 35: 971-974 (key to females of included spp.). —Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 347, 385-402 (key to included spp.). —Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 326. —Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 382-383. —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 19-22 (modification of key). —Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 2-5 (key to spp. allied to *hilaris*).

**albihirta albihirta** Timberlake. South. Calif. (Colorado Desert). Pollen: Apparently an oligolege of *Geraea canescens*, but visits the flowers of *Encelia farinosa* and *Melilotus* presumably for nectar.

*Perdita albihirta albihirta* Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 395, fig. 79. ♀, ♂.

**albihirta geraeae** Timberlake. Calif. (Colorado and Mojave Deserts), Nev. (Stateline). Pollen: Apparently an oligolege of *Geraea canescens*, but visits the flowers of *Acamptopappus sphaerocephalus* var. *hirtellus* and *Larrea tridentata* presumably for nectar.

*Perdita albihirta geraeae* Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 396. ♀, ♂.

**albipennis albipennis** Cresson. N. Dak. south to Tex., west to Wyo., Colo. and Ariz. Pollen:

Unknown, but visits flowers of *Helianthus annuus*, *H. petiolaris*, *Hymenopappus*, *Nolina*, *Prionopsis ciliata*. Predator: *Philaenus ventilabris* Fabr.

*Perdita(?) albipennis* Cresson, 1868. Amer. Ent. Soc., Trans. 1: 386. ♀.

*Perdita hyalina* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 68. ♂.

*Perdita albipennis* var. *helianthi* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 104. ♂, ♀.

*Perdita albipennis* var. *helianthi* mut. *pasonis* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 105. ♂.

*Perdita lacteipennis* Swenk and Cockerell, 1907. Ent. News 18: 51. ♀, ♂.

Taxonomy: Cockerell, 1899. Psyche 8: 419. ♂ (as *hyalina*). —Cockerell, 1899. Psyche 8: 419. ♂ (as *pasonis*). —Timberlake, 1953. Kans. Univ. Sci. Bul. 35: 977-978 (geogr. and floral records, as *lacteipennis lacteipennis*). —Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 388, 390, 391, 398, 400 (geogr. and floral records, in part, as *albipennis*, *lacteipennis lacteipennis*, *pasonis* and *hyalina*). —Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 130-131 (types, synonymy, status discussed). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 20 (synonymy, status discussed).

- Biology: Alcorn and Gamboa, 1975. Ariz. Acad. Sci. 10: 163 (predator).
- albipennis canadensis** Crawford. Alta., Idaho, N. Dak., Utah (Uinta and Wasatch Counties).  
*Perdita canadensis* Crawford, 1912. Canad. Ent. 44: 360. ♀.
- Taxonomy: Stevens, 1919. Canad. Ent. 51: 205. ♂. —Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 388, 390, 398-399 (key, tax. status, as *lacteipennis canadensis*). —Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 130-131 (status discussed).
- albipennis heliophila** Cockerell. Utah, Colo., N. Mex.; Mexico (Chihuahua). Pollen: Unknown, but visits flowers of *Helianthus* including *H. annuus*.  
*Perdita heliophila* Cockerell, 1916. Ann. and Mag. Nat. Hist. (8) 17: 281. ♀.
- Taxonomy: Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 390, 397, figs. 82, 83, 158 (tax. characters and tax. status). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 20 (tax. characters). —Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 2 (tax. characters).
- albipennis pallidipennis** Graenicher. Ind. and Wis., west to east. Kans. and Nebr. Pollen: Unknown, but visits flowers of *Helianthus annuus*.  
*Perdita pallidipennis* Graenicher, 1910. Canad. Ent. 42: 101. ♀, ♂.
- Taxonomy: Timberlake, 1953. Kans. Univ. Sci. Bul. 35: 978 (tax. characters and status, as *lacteipennis pallidipennis*). —Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 388, 390, 399 (key, geogr. records). —Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 131 (status discussed). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 302-303, table 9 (redescription).
- beata beata** Cockerell. Tex. (Davis Mts. and El Paso), N. Mex. (Las Cruces and Mesilla Park). Pollen: Unknown, but visits flowers of *Verbesina encelioides*. Another subspecies, *Perdita beata signata* Timberlake, occurs in Mexico (Chihuahua, Coahuila and Durango).  
*Perdita beata* Cockerell, 1895. Psyche 1 (sup.): 10. ♀.
- Taxonomy: Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 386, 391 (key, geogr. and floral record). —Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 130 (tax. status).
- bequaerti bequaerti** Viereck. N. J. to Fla., west to Minn. and Miss. Pollen: Unknown, but visits flowers of *Bidens*, *Helianthus divaricatus*, *Physalis lanceolata*, *P. virginiana*.  
*Perdita (Cockerellia) bequaerti* Viereck, 1917. Amer. Mus. Nat. Hist., Bul. 37: 241. ♀, ♂.
- Taxonomy: Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 397, figs. 80, 157 (tax. characters). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 300, figs. 72-74, 79, table 9 (redescription).
- bequaerti indianensis** Cockerell. Ind. (Gary and Lafayette), Okla. (South McAlester), Tenn. (Knoxville).  
*Perdita pallidipennis indianensis* Cockerell, 1922. Amer. Mus. Novitates 33: 2. ♂, ♀.  
*Perdita (Cockerellia) wickhami* Cockerell, 1922. Amer. Mus. Novitates 33: 13. ♀.
- Taxonomy: Timberlake, 1952. Ent. Soc. Wash., Proc. 54: 204 (tax. status). —Timberlake, 1953. Kans. Univ. Sci. Bul. 35: 976 (tax. characters, synonymy). —Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 388, 390, 397 (key, tax. status, geogr. range). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 302, fig. 72 (status discussed).
- coreopsidis collaris** Cockerell. N. Mex.; Mexico (Chihuahua).  
*Perdita verbesinae collaris* Cockerell, 1916. Ann. and Mag. Nat. Hist. (8) 17: 281. ♂.
- Taxonomy: Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 389, 390, 401 (key, redescription).
- coreopsidis coreopsidis** Cockerell. Kans., Tex.; Mexico (Coahuila). Pollen: Unknown, but visits flowers of *Gaillardia* which it apparently prefers, but also has been taken at the flowers of *Coreopsis* and *Monarda punctata coryi*.  
*Perdita coreopsidis* Cockerell, 1906. Entomologist 39: 126. ♀, ♂.
- Taxonomy: Timberlake, 1953. Kans. Univ. Sci. Bul. 35: 983-984 (geogr. and floral records). —Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 389, 390, 401 (key, geogr. and floral records). —Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 4 (key).

**coreopsidis kansensis** Timberlake, Kans. (Grove and Ford Counties), Tex. (Van Horn), N. Mex. (Roosevelt County), Utah (Iron County). Pollen: Unknown, but visits flowers of *Gaillardia*.

*Perdita coreopsidis kansensis* Timberlake, 1953. Kans. Univ. Sci. Bul. 35: 984. ♀, ♂.

Taxonomy: Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 389, 390, 401 (key, geogr. range).

—Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 20 (geogr. records).

**coreopsidis obscurior** Timberlake, Gulf Coast of Tex. (Galveston to Brownsville, but a male has been taken inland at Lytle, Atacosa County). Pollen: Unknown, but visits flowers of *Gaillardia*.

*Perdita coreopsidis obscurior* Timberlake, 1953. Kans. Univ. Sci. Bul. 35: 984. ♀, ♂.

Taxonomy: Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 389, 390, 401 (key, geogr. records).

**fractinecta** Timberlake, Tex. (Sarita). Pollen: Unknown, but visits flowers of *Coreopsis*.

*Perdita fractinecta* Timberlake, 1953. Kans. Univ. Sci. Bul. 35: 976. female.

Taxonomy: Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 388, 397 (key).

**hilaris** Timberlake, Utah (Dixie State Park), N. Mex. (San Juan County). Pollen: Unknown, but visits flowers of *Chrysothamnus nauseosus*.

*Perdita hilaris* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 21, figs. 1207, 1208, 1307. ♂.

Taxonomy: Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 2-3. ♀.

**imbellis** Timberlake, Ariz. (Coconino County).

*Perdita imbellis* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 21, figs. 1205, 1206, 1306. ♂.

**incana** Timberlake, Tex. (Culberson County), N. Mex. (Quay County).

*Perdita incana* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 383. ♀, ♂.

**lepachidis lepachidis** Cockerell, Kans., Tex., Colo., N. Mex. Pollen: Unknown, but visits flowers of *Ratibida tagetes*.

*Perdita lepachidis* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 106. ♂.

Taxonomy: Timberlake, 1953. Kans. Univ. Sci. Bul. 35: 982-983. ♀. —Timberlake, 1954. Calif.

Univ. Pubs. Ent. 9: 389, 391, 401 (key). —Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 4 (key).

**lepachidis levifrons** Timberlake, Tex. (Brownsville).

*Perdita lepachidis levifrons* Timberlake, 1953. Kans. Univ. Sci. Bul. 35: 983. ♀, ♂.

Taxonomy: Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 389, 391, 401 (key).

**lingualis** Cockerell, Nebr., Kans., Tex., N. Mex., Colo., Utah; Mexico (Tamaulipas). Pollen:

Apparently an oligolege of *Helianthus* including *H. annuus*, *H. petiolaris*, but may also visit other large flowered Compositae.

*Perdita albipennis* var. *lingualis* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 105. ♀.

Taxonomy: Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 130, 131 (tax. status). —Michener,

1963. Kans. Ent. Soc., Jour. 36: 117-118, figs. 2-6 (prepupa). —Rozen, 1966. Amer. Mus.

Novitates 2259: 21, figs. 52-54 (larva). —Yager and Rozen, 1966. Amer. Mus. Novitates

2265: 12, figs. 17-18 (pupa). —Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 4 (key).

Biology: Michener, 1963. Kans. Ent. Soc., Jour. 36: 114-118, 6 figs. (nest architecture, colonial behavior, floral relationships).

**luculenta** Timberlake, South. Calif. (Imperial County).

*Perdita luculenta* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 19. ♀.

**perpulchra flavidiior** Timberlake, Kans., (Barton and Rice Counties), Tex. (Somervell County).

Pollen: Unknown, but visits flowers of *Aphanostephus skirrhobasis*, *Heterotheca subaxillaris*, *Rudbeckia bicolor*.

*Perdita perpulchra flavidiior* Timberlake, 1953. Kans. Univ. Sci. Bul. 35: 975. ♀.

Taxonomy: Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 395. —Timberlake, 1956. Calif. Univ.

Pubs. Ent. 11: 327 (geogr. and floral records).

**perpulchra perpulchra** Cockerell, Tex. (El Paso), N. Mex. (Mesilla Valley), Ariz. (Holbrook and Tucson); Mexico (Aguascalientes and Durango). Pollen: Unknown, but visits flowers of

*Asclepias*, *Baileya*, *Haplopappus heterophylla*, *Verbesina encelioides*.

*Perdita perpulchra* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 99. ♀.



*Perdita baileyae* Cockerell, 1909. *Canad. Ent.* 41: 151. ♂.

Taxonomy: Cockerell, 1897. *Ann. Mag. and Nat. Hist.* (6) 19: 398. ♂. —Timberlake, 1953. *Kans. Univ. Sci. Bul.* 35: 975 (tax. characters). —Timberlake, 1954. *Calif. Univ. Pubs. Ent.* 9: 387, 389, 395 (key, tax. characters). —Timberlake, 1956. *Calif. Univ. Pubs. Ent.* 11: 327 (synonymy, tax. status).

**perpulchra punctissima** Timberlake. *Tex.* (Bexar, Wood, Robertson, Lamar Counties). Pollen: Unknown, but visits flowers of *Heterotheca subaxillaris*.

*Perdita perpulchra punctissima* Timberlake, 1956. *Calif. Univ. Pubs. Ent.* 11: 327. ♀, ♂.

**pulchella** Timberlake. *Tex.* (Carrizo Springs).

*Perdita pulchella* Timberlake, 1954. *Calif. Univ. Pubs. Ent.* 9: 393. ♀.

**purpurascens** Timberlake. *Tex.* Pollen: Unknown, but visits flowers of *Aster tanacetifolius*, *Brazoria truncata*, *Gaillardia*, *Monarda*.

*Perdita purpurascens* Timberlake, 1956. *Calif. Univ. Pubs. Ent.* 11: 328. ♂.

Taxonomy: Timberlake, 1958. *Calif. Univ. Pubs. Ent.* 14: 382-383. ♀ (tax. characters, geogr. and floral records).

**scopata** Timberlake. *Gulf Coast of Tex.* (Galveston to Brownsville). Pollen: Unknown, but visits flowers of *Coreopsis*, *Helianthus annuus*.

*Perdita scopata* Timberlake, 1953. *Kans. Univ. Sci. Bul.* 35: 980. ♀, ♂.

Taxonomy: Timberlake, 1954. *Calif. Univ. Pubs. Ent.* 9: 401, fig. 88 (tax. characters).

**shinnersi** Timberlake. *Tex.* Pollen: Unknown, but visits flowers of *Brazoria truncata*, *Coreopsis basalis*, *Gaillardia*, *Hymenopappus artemisiaefolius*, *Monarda*.

*Perdita shinnersi* Timberlake, 1956. *Calif. Univ. Pubs. Ent.* 11: 326. ♀, ♂.

Taxonomy: Timberlake, 1958. *Calif. Univ. Pubs. Ent.* 14: 383 (geogr. and floral records).

**tricincta** Timberlake. *South. Tex.* (Cameron, Hidalgo and Starr Counties). Pollen: Unknown, but visits flowers of *Helianthus annuus*. This may prove to be a race of *Perdita albipennis* Cress.

*Perdita tricincta* Timberlake, 1953. *Kans. Univ. Sci. Bul.* 35: 978. ♀, ♂.

Taxonomy: Timberlake, 1954. *Calif. Univ. Pubs. Ent.* 9: 388, 390, 400, fig. 86 (key, tax. status).

**utahensis** Cockerell. *N. Mex.* (Rodeo), *Ariz.* (Tucson), southwest. *Utah*, south. *Calif.* (Colorado Desert). Pollen: Unknown, but visits flowers of *Pectis papposa*, *Tidestromia*, *Verbesina encelioides*.

*Perdita utahensis* Cockerell, 1896. *Acad. Nat. Sci. Phila., Proc.* 48: 106. ♀.

Taxonomy: Timberlake, 1953. *Kans. Univ. Sci. Bul.* 35: 974. ♂. —Timberlake, 1954. *Calif. Univ. Pubs. Ent.* 9: 387, 391, 394, figs. 76, 155 (tax. characters, geogr. and floral records). —Timberlake, 1968. *Calif. Univ. Pubs. Ent.* 49: 20 (geogr. and floral records).

**verbesinae** Cockerell. *Tex.* (Barstow), *N. Mex.* (Deming and Las Cruces), *Ariz.* (Douglas, Portal, Tucson and Santa Rita Mts.); *Mexico* (Chihuahua). Pollen: Usually visits flowers of *Verbesina encelioides*, but has been recorded from the flowers of *Helianthus*.

*Perdita verbesinae* Cockerell, 1896. *Acad. Nat. Sci. Phila., Proc.* 48: 102. ♀, ♂.

*Perdita verbesinae* mut. *intermedia* Cockerell, 1896. *Acad. Nat. Sci. Phila., Proc.* 48: 103. ♀.

*Perdita verbesinae* mut. *nigrior* Cockerell, 1896. *Acad. Nat. Sci. Phila., Proc.* 48: 103. ♀.

*Perdita verbesinae* mut. *cyanella* Cockerell, 1896. *Acad. Nat. Sci. Phila., Proc.* 48: 104. ♂.

*Perdita verbesinae* mut. *maculata* Cockerell, 1896. *Acad. Nat. Sci. Phila., Proc.* 48: 104. ♂.

Taxonomy: Cockerell, 1899. *Psyche* 8: 323 (color variation). —Timberlake, 1954. *Calif. Univ. Pubs. Ent.* 9: 388, 391, 397, fig. 81 (key, tax. characters, geogr. and floral records).

#### Genus PERDITA Subgenus COCKERELLULA Strand

*Perdita* subg. *Lutziella* Cockerell, 1922. *Amer. Mus. Novitates* 47: 1. Preocc.

Type-species: *Perdita (Lutziella) opuntiae* Cockerell. Monotypic and orig. desig.

*Perdita* subg. *Cockerellula* Strand, 1932. *Folia Zool. Hydrobiol. Riga* 4: 196. N. name.

Taxonomy: Timberlake, 1953. Kans. Univ. Sci. Bul. 35: 963-968 (tax. characters, key to included spp.). —Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 346, 354-356 (key to included spp., tax. characters). —Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 122-123 (key to males of included spp.). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 2 (modified key to males).

**bidenticauda** Timberlake. Tex. (Big Bend Park). Pollen: Unknown, but visits flowers of *Opuntia*.

*Perdita bidenticauda* Timberlake, 1953. Kans. Univ. Sci. Bul. 35: 965. ♂, ♀.

Taxonomy: Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 356, figs. 13, 14, 122 (tax. characters, key). —Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 122 (key). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 2 (key).

**knulli** Timberlake. Tex. (Davis Mts.). Pollen: Unknown, but the female allotype bears dark brown pollen, with spherical and moderately fine grains.

*Perdita knulli* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 123, figs. 652, 653, 728. ♂, ♀.

Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 2. ♂ (key).

**laticauda** Timberlake. Tex. (Dryden); Mexico (Coahuila). Pollen: Unknown, but visits flowers of *Chamaesaracha conioides*, *Gaillardia*, *Gilia acerosa*.

*Perdita laticauda* Timberlake, 1953. Kans. Univ. Sci. Bul. 35: 967. ♂, ♀.

Taxonomy: Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 356, figs. 15, 16, 123 (tax. characters, key). —Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 122. ♂ (key).

**lobata** Timberlake. Tex. (Hidalgo and Starr Counties). Pollen: Unknown, but visits flowers of *Opuntia*.

*Perdita lobata* Timberlake, 1953. Kans. Univ. Sci. Bul. 35: 967. ♂.

Taxonomy: Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 354, 356, figs. 17, 18, 124 (tax. characters, key). —Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 122. ♂, ♀ (tax. characters, key).

**opuntiae** Cockerell. Colo., Wyo., S. Dak. (Pine Ridge). Ecology: Nests in soft sandstone rocks of the Laramie formation. Pollen: Collects pollen from the flowers of *Opuntia*.

*Perdita (Lutziella) opuntiae* Cockerell, 1922. Amer. Mus. Novitates 47: 2. ♂, ♀.

Taxonomy: Timberlake, 1953. Kans. Univ. Sci. Bul. 35: 964 (key). —Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 354, 355, figs. 9, 10, 120 (tax. characters, key). —Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 122. ♂ (key).

Biology: Custer, 1928. Psyche 35: 67-84 (nesting habits). —Custer, 1929. Canad. Ent. 61: 49 (nesting habits). —Custer, 1929. Psyche 36: 293 (nesting habits).

### Genus **PERDITA** Subgenus **EPIMACROTERA** Timberlake

*Perdita* subg. *Epimacrotera* Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 377.

Type-species: *Perdita ainsliei* Crawford. Orig. desig.

Taxonomy: Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 378-379 (key to included spp.).

—Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 380 (modified key to included spp.).

—Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 129 (tax. characters, relationship to *Glossoperdita*). —Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 92-93 (revised key to included spp.). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 14-15 (key to males).

**ainsliei** Crawford. Iowa, N. Mex. (Bernalillo County).

*Perdita ainsliei* Crawford, 1932. Ent. Soc. Wash., Proc. 34: 74. ♂, ♀.

Taxonomy: Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 378, 379, figs. 55, 56, 144 (key, tax. characters). —Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 380 (key, geogr. record).

—Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 93 (key). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 14 (key).

**biguttata** Timberlake. Ariz. (Cochise County). Pollen: Unknown, but visits flowers of *Eriogonum abertianum* var. *neomexicanum*, *Euphorbia*.

*Perdita biguttata* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 95. ♀.

*Perdita parvula* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 15, figs. 1202, 1304. ♂.

Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 15 (synonymy in footnote).

- binotata** Timberlake. Ariz.; Mexico (Baja California). Pollen: Unknown, but visits flowers of *Physalis*.  
*Perdita binotata* Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 385, figs. 73, 74, 153. ♀, ♂.  
 Taxonomy: Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 93 (key). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 14 (key).
- crassula** Timberlake. N. Mex. (Las Cruces), Ariz. (Willcox). Pollen: Unknown, but visits flowers of *Euphorbia*.  
*Perdita crassula* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 381, figs. 462, 463, 516. ♂.  
 Taxonomy: Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 93-94. ♀ (key). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 14 (key).
- diversa** Timberlake. Tex. (El Paso); Mexico (Coahuila, Nuevo Leon). Pollen: Unknown, but visits flowers of *Coldenia greggii*.  
*Perdita diversa* Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 384, figs. 69, 70, 151. ♂, ♀.  
 Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 15, 19 (key).
- euphorbiae** Timberlake. Ariz. (Picacho Pass); Mexico (Sonora). Pollen: Unknown, but visits flowers of *Euphorbia*, *Kallstroemia*.  
*Perdita euphorbiae* Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 380, figs. 59, 60, 146. ♀, ♂.  
 Taxonomy: Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 130 (geogr. and floral records). —Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 93 (key). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 15, 17 (key, geogr. record).
- namatophila** Timberlake. Calif. (Riverside County). Pollen: Unknown, but visits flowers of *Nama demissum*.  
*Perdita namatophila* Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 379, figs. 57, 58, 145. ♂.  
 Taxonomy: Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 380 (key). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 15 (key).
- nanula** Timberlake. Ariz. (Douglas). Pollen: Unknown, but visits flowers of *Euphorbia albomarginata*.  
*Perdita nanula* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 129. ♀.  
 Taxonomy: Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 93 (key). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 15, 16. ♂ (key).
- nigrocaerulea** Timberlake. Calif. (Oro Grande Wash). Pollen: Unknown, but visits flowers of *Salazaria mexicana*.  
*Perdita nigrocaerulea* Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 382, figs. 65, 66, 149. ♂.  
 Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 15 (key).
- peculiaris** Timberlake. Tex. (Terrell County). Pollen: Unknown, but visits flowers of *Chamaesaracha conoides*.  
*Perdita peculiaris* Timberlake, 1953. Kans. Univ. Sci. Bul. 35: 970. ♂.  
 Taxonomy: Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 384, figs. 71, 72, 152 (tax. characters). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 15 (key).
- polycarpae** Timberlake. South. Calif.; Mexico (Baja California). Pollen: Possibly an oligolege of *Euphorbia* including *E. polycarpa*, but also visits flowers of *Pectis papposa*.  
*Perdita polycarpae* Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 381, figs. 61, 62, 147. ♂, ♀.  
 Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 14 (key).

### Genus PERDITA Subgenus GLOSSOPERDITA Cockerell

*Glossoperdita* Cockerell, 1916. Pomona Jour. Ent. Zool. 8: 43.

Type-species: *Glossoperdita pelargoides* Cockerell. Monotypic.

Taxonomy: Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 347, 392-394 (redescription, key to included spp.). —Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 379 (key to included spp.).

**blaisdelli** Timberlake. Calif. (Calaveras County).

*Perdita blaisdelli* Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 373. ♀.

*giliae* Timberlake. Ariz. Pollen: Unknown, but visits flowers of *Gilia*, possibly *G. aggregata*.

*Perdita giliae* Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 374, figs. 51, 52, 141. ♀, ♂.

Taxonomy: Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 379 (key).

*hurdi* Timberlake. South. Calif., Ariz.; Mexico (Sonora). Ecology: Cuts unopened flowers of *Proboscidea* in order to obtain pollen. Pollen: Collects pollen from the flowers of *Proboscidea althaeafolia*, *P. arenaria*.

*Perdita hurdi* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 324, figs. 283, 284, 335. ♀, ♂.

Taxonomy: Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 379 (key). —Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 127-128 (tax. characters, geogr. and floral records).

Biology: Hurd and Linsley, 1963. Kans. Ent. Soc., Jour. 36: 248-252, 5 figs. (corolla cutting habits, floral relationships).

*navarretiae angusticeps* Timberlake. Calif. (Tuolumne County).

*Perdita navarretiae angusticeps* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 128. ♂, ♀.

*navarretiae navarretiae* Timberlake. Calif. (Mariposa County). Pollen: Unknown, but visits flowers of *Navarretia viscidula*.

*Perdita navarretiae* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 379, figs. 460, 461, 515. ♂.

Taxonomy: Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 128 (tax. status).

*navarretiae powelli* Timberlake. Calif. (Nevada County).

*Perdita navarretiae powelli* Timberlake, 1962. Calif. Univ. Pubs. Ent. 91. ♂, ♀.

*pelargoides* (Cockerell). South. Calif. (cismontane). Pollen: Unknown, but visits flowers of *Hugelia virgata*, *Navarretia attractyloides*.

*Glossoperdita pelargoides* Cockerell, 1916. Pomona Jour. Ent. Zool. 8: 43. ♀.

Taxonomy: Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 373, figs. 49, 50, 140. ♂.

—Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 379 (key).

#### Genus PERDITA Subgenus HESPEROPERDITA Timberlake

*Perdita* subg. *Hesperoperdita* Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 374.

Type-species: *Perdita ruficauda* Cockerell. Orig. desig.

Taxonomy: Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 375 (key to included spp.).

*pyrifera* Cockerell. Calif. (Pleito, Monterey County).

*Perdita pyrifera* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 192. ♀.

Taxonomy: Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 376, fig. 142. ♂.

*trisignata ornata* Timberlake. North. Calif. Pollen: Possibly an oligolege of *Lotus*, visits flowers of *L. glaber*, *L. nevadensis*, *L. strigosus* var. *hirtellus*.

*Perdita ruficauda ornata* Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 377. ♀, ♂.

Taxonomy: Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 127 (tax. status).

*trisignata trisignata* Cockerell. South. Calif.; Mexico (Baja California). Pollen: Possibly an oligolege of *Lotus* including *L. americanus*, *L. argophyllus*, *L. davidsonii*, *L. scoparius*, *L. strigosus*, but also visits other flowers including *Cryptantha*, *Heteromeles*.

*Perdita trisignata* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 76. ♀.

*Perdita ruficauda* Cockerell, 1916. Pomona Jour. Ent. Zool. 8: 44. ♀.

Taxonomy: Cockerell, 1922. U. S. Natl. Mus., Proc. 60: 17. ♀, ♂ (as *ruficauda*).

—Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 375, 376 (key, type). —Timberlake, 1954.

Calif. Univ. Pubs. Ent. 9: 375, 376, figs. 53, 54, 143 (key, tax. characters, geogr. and floral records, as *ruficauda*). —Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 127 (synonymy).

#### Genus PERDITA Subgenus HETEROOPERDITA Timberlake

*Perdita* subg. *Heteroperdita* Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 365.

Type-species: *Perdita rhodogastra* Timberlake. Orig. desig.

The species of this subgenus apparently collect pollen exclusively from flowers of the boraginaceous genera *Coldenia* and *Heliotropium*.

- Taxonomy: Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 347, 366 (key to included spp.).  
 —Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 126 (modified key to included spp.).  
 —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 10-11 (key to females of included spp.).
- arenaria** Timberlake. Ariz. (Yuma), Nev. (Washoe County), south. Calif. (Colorado Desert).  
 Pollen: Apparently an oligolege of *Coldenia* including *C. nuttallii*, *C. palmeri*.  
*Perdita arenaria* Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 368, figs. 39, 40, 135. ♂, ♀.
- Taxonomy: Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 126 (key). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 11, 13 (key, geogr. and floral records).
- bellula** Timberlake. South. Calif. (Colorado Desert). Pollen: Apparently an oligolege of *Coldenia* including *C. palmeri*, *C. plicata*.  
*Perdita bellula* Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 369, figs. 41, 42, 136. ♂, ♀.
- Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 11 (key).
- coldeniae** Timberlake. South. Calif. (Colorado Desert). Pollen: Apparently an oligolege of *Coldenia* including *C. palmeri*, but visits flowers of *Pectis papposa* presumably for nectar.  
*Perdita coldeniae* Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 368, figs. 37, 38, 134. ♂, ♀.
- Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 11 (key).
- frontalis** Timberlake. South. Calif. (Colorado Desert). Pollen: Apparently an oligolege of *Coldenia* including *C. plicata*, but visits flowers of *Eriogonum deserticola* presumably for nectar.  
*Perdita frontalis* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 12. ♀.
- maculosa** Timberlake. South. Calif. (Colorado Desert). Pollen: Apparently an oligolege of *Coldenia* including *C. plicata*.  
*Perdita maculosa* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 378, fig. 514. ♀, ♂.
- Taxonomy: Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 126 (key). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 11 (key).
- optiva** Timberlake. South. Calif. (Colorado Desert). Pollen: Apparently an oligolege of *Coldenia* including *C. palmeri*.  
*Perdita optiva* Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 371, figs. 47, 48, 139. ♂ (♀ misdet.).
- Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 13. ♂ (tax. status, as *sexfasciata*).
- rhodogastra** Timberlake. South. Calif. (Colorado Desert). Pollen: Apparently collects pollen from the flowers of *Coldenia palmeri* and *Heliotropium oculatum*, but visits these and other flowers for nectar including *Pectis papposa*, *Pluchea sericea*.  
*Perdita rhodogastra* Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 367, figs. 35, 36, 133. ♀, ♂.
- Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 11 (key).
- scutellaris** Timberlake. Southern Calif. (Colorado Desert). Pollen: Apparently an oligolege of *Coldenia* including *C. plicata*, but visits the flowers of *Eriogonum deserticola* presumably for nectar.  
*Perdita scutellaris* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 89, figs. 829, 830, 893, text fig. B. ♀, ♂.
- Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 11 (key).
- sexfasciata** Timberlake. Ariz. (Yuma County), south. Calif. (Riverside and San Bernardino Counties). Pollen: Apparently an oligolege of *Coldenia* including *C. palmeri*, but visits these and other flowers for nectar including *Cryptantha*, *Nama*.  
*Perdita sexfasciata* Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 370, figs. 43, 44, 137. ♂.
- Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 11, 13. ♀ (key).
- trifasciata** Timberlake. Tex. (Dryden), N. Mex. (White Sands); Mexico (Coahuila).  
*Perdita trifasciata* Timberlake, 1953. Kans. Univ. Sci. Bul. 35: 969. ♂.
- Taxonomy: Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 366, 370, figs. 45, 46, 138. ♀.  
 —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 11, 14 (key).

*vesca* Timberlake. Nevada (Wadsworth). Pollen: Possibly an oligolege of *Coldenia*, visits flowers of *C. nuttallii*.

*Perdita vesca* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 11, figs. 1199, 1200, 1303. ♀, ♂. *wasbaueri* Timberlake. South. Calif. (Colorado Desert). Pollen: Apparently an oligolege of *Coldenia plicata*.

*Perdita wasbaueri* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 126, figs. 656, 657, 730. ♀, ♂.

Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 11 (key).

#### Genus PERDITA Subgenus HEXAPERDITA Timberlake

*Perdita* subg. *Hexaperdita* Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 416.

Type-species: *Perdita ignota* Cockerell. Orig. desig.

These bees are exclusively oligoleges of the family Compositae.

Taxonomy: Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 348 (key). —Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 247-252 (key to included spp.).

*agasta* Timberlake. Tex. (Hidalgo Co.).

*Perdita agasta* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 389. ♀.

*alexi* Timberlake. Tex. (College Station), Kans. (Barber County). Pollen: Unknown, but visits flowers of *Helianthus petiolaris*, *Heterotheca subaxillaris*.

*Perdita alexi* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 26. ♀.

*asteris* Cockerell. West. Tex., N. Mex., Ariz. Pollen: Unknown, but visits flowers of *Aplopappus*, *Aster canescens*, *Chrysopsis*, *Heterotheca subaxillaris*, *Nolina microcarpa*, *Verbesina encelioides*.

*Perdita asteris* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 93. ♀.

*Perdita vespertilio* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 95. ♂.

*Perdita crassiceps* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 97. ♂.

*Perdita vagans* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 101. ♂.

*Perdita mellina* Cockerell, 1900. Entomologist 33: 62. ♂.

Taxonomy: Cockerell, 1906. Entomologist 39: 148. ♀ (as *vespertilio*). —Timberlake, 1956.

Calif. Univ. Pubs. Ent. 11: 249, 258 (key, tax. characters, geogr. and floral records).

—Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 389-390 (tax. characters, geogr. and floral records). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 27 (synonymy, geogr. and floral records).

*bebbiae* Timberlake. Calif. (San Diego County). Pollen: Unknown, but visits flowers of *Bebbia juncea*.

*Perdita bebbiae* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 255, figs. 179, 180, 292. ♀, ♂.

*bishoppi bishoppi* Cockerell. N. C. to Fla., west to Tex. Pollen: Unknown, but visits flowers of *Heterotheca latifolia*, *H. subaxillaris*, *Isopappus divaricatus*.

*Perdita bishoppi* Cockerell, 1906. Entomologist 39: 148. ♀, ♂.

Taxonomy: Cockerell, 1922. Amer. Mus. Novitates 33: 7. —Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 249, 250, 261, figs. 193, 194, 299 (key, tax. characters, geogr. and floral records). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 303-304, figs. 72-74, 79, table 9 (redescription).

*bishoppi planorum* Timberlake. Kans., Tex. Pollen: Unknown, but visits flowers of *Heterotheca latifolia*, *H. subaxillaris*, *Isopappus divaricatus*.

*Perdita bishoppi planorum* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 261. ♀, ♂.

*blatchleyi* Timberlake. Fla. (Dunedin). Pollen: Unknown, but visits flowers of *Chrysopsis*.

*Perdita blatchleyi* Timberlake, 1952. Ent. Soc. Wash., Proc. 54: 201. ♀.

Taxonomy: Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 248, 258 (key). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 304, fig. 72, table 9 (redescription).

*boltoniae boltoniae* (Robertson). Ill., La., Miss. Pollen: Unknown, but visits flowers of *Boltonia*.

*Perditella boltoniae* Robertson, 1902. Canad. Ent. 34: 321. ♀, ♂.

Taxonomy: Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 249, 252, 265 (key, tax. characters, geogr. records). — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 304-305, fig. 73, table 9 (redescription).

**boltoniae chrysopsina** Timberlake. N. J. to Fla. Pollen: Unknown, but visits flowers of *Chrysopsis mariana*, *Coreopsis*, *Erigeron*, *Gerardia*, *Haplopappus*.

*Perdita chrysopsina* Timberlake, 1928. Hawaii. Ent. Soc., Proc. 7: 155. ♂, ♀.

Taxonomy: Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 250, 252, 265, figs. 199, 200, 302 (key, tax. characters). — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 305-306, figs. 72, 74, table 9 (redescription).

**callicerata** Cockerell. Tex. to south. Calif.; Mexico (Chihuahua, Durango). Pollen: Unknown, most frequently has been collected at the flowers of *Baileya multiradiata*, but also visits flowers of *Baileya pleniradiata*, *Baccharis*, *Dithyrea wislizenii*, *Haplopappus*. *Perdita callicerata* Cockerell, 1896. N. Y. Ent. Soc., Jour. 4: 206. Nomen nudum, validated by Cockerell, 1897. Amer. Ent. Soc., Trans. 24: 153. male.

*Perdita callicerata* var. *chrysoceras* Cockerell, 1897. N. Mex. Agr. Expt. Sta., Bul. 24: 43. ♂.

*Perdita callicerata* var. *leucura* Cockerell, 1909. Canad. Ent. 41: 152. ♀.

*Perdita lutzii* Cockerell, 1922. Amer. Mus. Novitates 33: 7. ♀.

Taxonomy: Cockerell, 1897. Acad. Nat. Sci. Phila., Proc. 49: 354. ♀. — Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 247, 248, 250, 255, figs. 181, 182, 293 (key, tax. characters, geogr. and floral records).

**cambarella cambarella** Cockerell. Tex. Pollen: Unknown, but visits flowers of *Heterotheca subaxillaris*, *Isopappus divaricatus*.

*Perdita cambarella* Cockerell, 1906. Entomologist 39: 150. ♀, ♂.

Taxonomy: Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 248, 251, 256-257 (key, tax. characters, geogr. and floral records). — Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 29 (color variation, geogr. records).

**cambarella platyura** Cockerell. Kans., Tex., N. Mex. Pollen: Unknown, but visits flowers of *Heterotheca latifolia*, *Isopappus divaricatus*.

*Perdita platyura* Cockerell, 1922. Ann. and Mag. Nat. Hist. (9) 10: 547. ♀.

Taxonomy: Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 248, 251, 257, figs. 183, 184, 294. ♂ (key, tax. characters, geogr. and floral records).

**cara** Timberlake. Tex. (Reeves County). Pollen: Unknown, but visits flowers of *Prosopis*.

*Perdita cara* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 388, figs. 466, 467, 518. ♂.

**compacta** Timberlake. Ariz. (Graham County). Pollen: Unknown, but visits flowers of *Pectis papposa*.

*Perdita compacta* Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 9. ♀.

**fedorensis** Cockerell. Tex. (Lee County).

*Perdita fedorensis* Cockerell, 1916. Ann. and Mag. Nat. Hist. (8) 17: 280. ♀.

Taxonomy: Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 249, 259 (key).

**foveata brachycephala** Timberlake. Tex. Pollen: Unknown, but visits flowers of *Aphanostephus skirrhobasis*, *Aster tanacetifolius*, *Coreopsis basalis*.

*Perdita foveata brachycephala* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 266. ♀, ♂.

**foveata foveata** Timberlake. Fla. (Dade and Pasco Counties), Tex. (Montgomery County), Ark. (Sevier and Scott Counties), Kans. (Reno County). Pollen: Unknown, but visits flowers of *Coreopsis tinctoria*, *Hymenopappus*.

*Perdita foveata foveata* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 265, figs. 201, 202, 303. ♀, ♂.

Taxonomy: Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 392 (geogr. and floral records). — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 307, figs. 72-74, 79, table 9 (redescription).

**foveata persimilis** Timberlake. Tex. (Comanche County), N. Mex. (Chaves County).

*Perdita foveata persimilis* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 267. ♀, ♂.

Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 29 (geogr. record).

- georgica** Timberlake. N. C. to Fla., west to Miss. Pollen: Unknown, but visits flowers of *Aster*, *Chrysopsis mariana*, *C. microcephala*, *Haplopappus*, *Heterotheca*, *Isopappus*.  
*Perdita georgica* Timberlake, 1928. Hawaii. Ent. Soc., Proc. 7: 158. ♂, ♀.
- Taxonomy: Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 249, 251, 257, figs. 185, 186, 295 (key, tax. characters, geogr. and floral records). — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 307-308, figs. 72-74, table 9 (redescription).
- graenicheri** Timberlake. Fla. (Miami). Pollen: Unknown, but visits flowers of *Chrysopsis tracyi*.  
*Perdita graenicheri* Timberlake, 1947. Ent. Soc. Wash., Proc. 49: 82. ♀, ♂.
- Taxonomy: Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 249, 252, 264, figs. 197, 198, 301 (key). — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 308-309, figs. 72, 73, table 9 (redescription).
- heterothecae heterothecae** Cockerell. Ariz., Utah (San Juan County), south. Calif. (Colorado Desert), Mexico (Baja California). Pollen: Unknown, but visits flowers of *Aster tephrodes*, *Grindelia*, *Gutierrezia californica*, *G. sarothrae*, *Heliotropium curassavicum*, *Heterotheca grandiflora*, *H. subaxillaris*, *Tamarix*.  
*Perdita heterothecae* Cockerell, 1900. Entomologist 33: 62. ♀, ♂.
- Taxonomy: Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 248, 251, 260-261, figs. 191, 192, 298 (key, tax. characters, geogr. and floral records). — Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 10 (geogr. and floral records).
- heterothecae trizonata** Timberlake. Ariz. (Willcox). Pollen: Unknown, but visits flowers of *Aster intricatus*, *Euphorbia*.  
*Perdita heterothecae trizonata* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 96. ♀, ♂.
- ignota basalis** Timberlake. Tex. (Hidalgo County); Mexico (Tamaulipas).  
*Perdita ignota basalis* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 391. ♀, ♂.
- ignota crawfordi** Cockerell. Colo., Nebr., Kans., Okla., Mo. Pollen: Unknown, but visits flowers of *Chrysopsis*, *Grindelia*, *Heterotheca subaxillaris*, *Isopappus divaricatus*, *Prionopsis ciliata*, *Sideranthus rubiginosus*.  
*Perdita crawfordi* Cockerell, 1901. Entomologist 34: 190. ♂, ♀.
- Taxonomy: Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 262-263, figs. 195, 196, 300 (tax. characters, geogr. and floral records).
- ignota ignota** Cockerell. Tex., Colo., Ariz.; Mexico (Chihuahua and Zacatecas). Pollen: Unknown, but visits flowers of *Baccharis*, *Chrysopsis rutteri*, *Erigeron*, *Heterotheca*, *Sideranthus*, *Solidago*.  
*Perdita ignota* Cockerell, 1896. Ent. Monthly Mag. 32: 220. ♀.
- Taxonomy: Cockerell, 1907. Colo. Univ., Studies 4: 247. ♀, ♂. — Cockerell, 1922. Amer. Mus. Novitates 33: 7 (tax. characters). — Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 250, 252, 262 (key, tax. characters, geogr. and floral records). — Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 10 (geogr. record).
- ignota isopappi** Timberlake. East. Tex., La. Pollen: Unknown, but visits flowers of *Aphanostephus skirrhobasis*, *Aster tanacetifolius*, *Chrysanthemum*, *Chrysopsis nuttallii*, *Grindelia*, *Helium tenuifolium*, *Heterotheca latifolia*, *H. pilosa*, *H. subaxillaris*, *Isopappus divaricatus*, *Prionopsis ciliata*, *Xanthisma texanum* var. *drummondii*.  
*Perdita isopappi* Timberlake, 1928. Hawaii. Ent. Soc., Proc. 7: 152. ♂, ♀.
- Taxonomy: Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 249, 252, 263-264 (key, tax. characters, geogr. and floral records).
- nubila** Timberlake. Fla., Ark., Kans. Pollen: Unknown, but visits flowers of *Erigeron ramosus*.  
*Perdita nubila* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 392. ♀, ♂.
- Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 29 (geogr. records).
- pratti** Cockerell. Tex., Okla., Kans. Pollen: Unknown, but visits flowers of *Helium*, *Helianthus cucumerifolius*, *H. petiolaris*, *Heterotheca latifolia*, *H. subaxillaris*.  
*Perdita pratti* Cockerell, 1906. Entomologist 39: 125. ♀.



Taxonomy: Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 248, 250, 252-253, figs. 173, 174, 289. ♂ (key, tax. characters, geogr. and floral records).

- xanthisma* Cockerell. Wyo., Nebr., Kans., Tex., N. Mex., Ariz. Pollen: Unknown, but visits flowers of *Aplopappus divaricatus*, *A. subruginosus*, *Croton monanthogynus*, *Grindelia*, *Gutierrezia*, *Helianthus annuus*, *Heterotheca pilosa*, *H. subaxillaris*, *Isopappus divaricatus*, *Prionopsis ciliata*, *Sideranthus*, *Xanthisma texanum*.  
*Perdita xanthismae* Cockerell, 1905. Ent. News 16: 331. ♀.  
*Perdita xanthismae sideranthi* Cockerell, 1906. Entomologist 39: 178. ♀.  
*Perdita xanthisma* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 29. Emend.

Taxonomy: Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 247, 249, 251, 258-259, figs. 187, 188, 296. ♀, ♂ (key, tax. characters, synonymy, geogr. and floral records). —Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 390 (geogr. and floral records). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 29-30 (geogr. and floral records).

#### Genus PERDITA Subgenus MACROTERA Smith

*Macrotera* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 130.

Type-species: *Macrotera bicolor* Smith. Monotypic.

The species of this subgenus are apparently oligoleges of *Opuntia*.

Taxonomy: Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 346, 352-353 (tax. characters, key to included spp.). —Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 375-378 (key to included spp.).

- crassa* Timberlake. Tex. (Sutton and Gillespie Counties). Pollen: Unknown, but possibly an oligolege of *Opuntia*.

*Perdita crassa* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 376, figs. 456, 457, 512. ♀, ♂.

- texana ablusa* Timberlake. N. Mex., Tex. Pollen: Collects pollen from flowers of *Opuntia phaeacantha* var. *major*.

*Perdita texana ablusa* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 376. ♀, ♂.

Biology: Barrows, Chabot, Michener and Snyder, 1976. Kans. Ent. Soc., Jour. 49: 275-279, 4 figs. (mating behavior, foraging, floral relationship, variation in head width, as *texana*).

- texana texana* (Cresson). Tex. (Bastrop, Gonzales, Lee and possibly Travis Counties). Pollen: Unknown, but visits flowers of *Opuntia*.

*Macrotera texana* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 70. ♀.

*Macrotera megacephala* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 71. ♂.

Taxonomy: Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 353, figs. 5, 6, 118 (tax. characters). —Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 375, 376 (tax. characters, status, synonymy).

#### Genus PERDITA Subgenus MACROTERELLA Timberlake

*Perdita* subg. *Macroterella* Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 360.

Type-species: *Perdita mortuaria* Timberlake. Orig. desig.

Taxonomy: Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 346, 361 (key to included spp.).

—Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 7-8 (key to females of included spp.; key to males of *carinata*, *mortuaria*, *opacella*).

- carinata* Timberlake. Calif. (Colorado Desert). Pollen: Unknown, but visits flowers of *Eriogonum*, *Eschscholzia minutiflora*, *Ferrocactus acanthodes*.

*Perdita carinata* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 9, figs. 1197, 1198, 1302. ♀, ♂.

- mellea* Timberlake. Ariz., south. Calif. (Colorado Desert); Mexico (Baja California and Sonora). Pollen: Apparently an oligolege of *Euphorbia* including *E. polycarpa*, *E. p.* var. *hirtella*.

*Perdita mellea* Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 364, figs. 33, 34, 132. ♂, ♀.

Taxonomy: Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 125 (geogr. and floral records). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 7 (key).

- mortuaria** Timberlake. South. Calif., Ariz.; deserts. Pollen: Unknown, but visits flowers of *Echinocereus engelmanni*, *Eriogonum inflatum*, *Eschscholzia californica*, *E. minutiflora* var. *darwinensis*, *Eucnide urens*, *Larrea tridentata*, *Prosopis juliflora*.  
*Perdita mortuaria* Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 362, figs. 27, 28, 129. ♂, ♀.
- Taxonomy: Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 324 (tax. characters, geogr. record, variation). —Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 126 (geogr. and floral record, variation). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 7, 8, 10 (key, geogr. and floral records).
- nigrella** Timberlake. South. Calif.; deserts. Pollen: Unknown, but visits flowers of *Phacelia* including *P. crenulata*.  
*Perdita nigrella* Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 362, figs. 29, 30, 130. ♂, ♀.
- Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 7 (key).
- opacella** Timberlake. Ariz. (Grand Canyon), Utah (Moab). Pollen: Unknown, but visits flowers of *Cleome lutea*, *Stanleya*.  
*Perdita opacella* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 324. ♀.
- Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 7, 8, figs. 3, 1195, 1196, 1301, 1353. ♂.
- solitaria** Cockerell. N. Mex. (Organ Mts.), Ariz. (Santa Catalina Mts.).  
*Perdita solitaria* Cockerell, 1896. N. Y. Ent. Soc., Jour. 4: 206. Nomen nudum.  
*Perdita solitaria* Cockerell, 1897. Amer. Ent. Soc., Trans. 24: 152. ♀.
- Taxonomy: Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 361, 365 (key, geogr. records). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 7 (key).
- tristella** Timberlake. South. Calif. (Riverside County). Pollen: Unknown, but visits flowers of *Calochortus splendens*, *Eriogonum fasciculatum*, *Hugelia virgata*, *Sphaeralcea*.  
*Perdita tristella* Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 363, figs. 31, 32, 131. ♂, ♀.
- Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 7 (key).

#### Genus PERDITA Subgenus MACROTROPSIS Ashmead

- Macroteropsis* Ashmead, 1899. Amer. Ent. Soc., Trans. 26: 85.  
 Type-species: *Perdita latior* Cockerell. Monotypic and orig. design.
- Taxonomy: Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 346, 356-357 (redescription, key to included spp.). —Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 87 (key to males of included spp.).
- arcuata arcuata** Fox. Calif. (San Benito County); Mexico (Baja California). Pollen: Apparently an oligolege of *Sphaeralcea*.  
*Perdita arcuata* Fox, 1893. Calif. Acad. Sci., Proc. (2) 4: 18. ♂.
- Taxonomy: Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 54 (tax. characters). —Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 357, 358 (key, tax. characters, tax. status). —Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 87 (key). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 4 (geogr. and floral record).
- arcuata dinognatha** Cockerell. Ariz. (Tempe), Nev. (Charleston Mts.), south. Calif.; deserts. Pollen: Apparently collects pollen only from the flowers of *Sphaeralcea ambigua*, but visits other flowers for nectar including *Encelia frutescens*, *Eriogonum fasciculatum* var. *polifolium*.  
*Perdita dinognatha* Cockerell, 1922. U. S. Natl. Mus., Proc. 60 (18): 19. ♂.
- Taxonomy: Timberlake, 1953. Kans. Univ. Sci. Bul. 35: 968 (tax. status, geogr. and floral records). —Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 357, 359, figs. 21, 22, 126. ♀ (key, geogr. and floral records).
- echinocacti** Timberlake. Ariz.; Mexico (Sinaloa and Sonora). Pollen: Unknown, but visits flowers of *Antigonon leptopus*, *Jacquemontia*, *Kallstroemia grandiflora*.  
*Perdita echinocacti* Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 360, figs. 25, 26, 128. ♂, ♀.
- Taxonomy: Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 125 (geogr. and floral records). —Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 87 (key).

- haplura** Cockerell. Tex. (Terrell and Val Verde Counties), N. Mex. (Lincoln County). Pollen: Unknown, but visits flowers of *Sphaeralcea angustifolia* var. *cuspidata*.  
*Perdita haplura* Cockerell, 1922. U. S. Natl. Mus., Proc. 60 (18): 19. ♀.
- Taxonomy: Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 124 (type). —Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 87-89, text fig. A. ♂. —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 4 (geogr. and floral records).
- laticornis** Cockerell. N. Mex., Ariz., Nev. (Charleston Mts.). Pollen: Apparently an oligolege of *Sphaeralcea* including *S. angustifolia*, but also visits flowers of *Sida hederacea* presumably for nectar.  
*Perdita laticornis* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 53. ♂, ♀.
- Taxonomy: Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 357, 359, figs. 23, 24, 127.  
 —Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 87 (key).
- magniceps** Timberlake. N. Mex. (Luna County). Pollen: Unknown, but visits flowers of *Sphaeralcea*.  
*Perdita magniceps* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 124, figs. 654, 655, 729. ♂.
- portalis** Timberlake. N. Mex. (Deming), Ariz. (Cochise and Coconino Counties); Mexico (Zacatecas). Pollen: Apparently an oligolege of *Sphaeralcea*.  
*Perdita portalis* Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 357, figs. 19, 20, 125. ♂, ♀.
- Taxonomy: Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 323. ♂ (variation). —Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 125 (geogr. and floral record). —Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 87. ♂ (key). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 4 (geogr. record).
- robertsi** Timberlake. Tex. (Val Verde County). Pollen: Possibly collects pollen from the flowers of *Opuntia*.  
*Perdita robertsi* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 6, fig. 2. ♀.

#### Genus PERDITA Subgenus PENTAPERDITA Cockerell and Porter

- Perdita* subg. *Pentaperdita* Cockerell and Porter, 1899. Ann. and Mag. Nat. Hist. (7) 4: 415.  
 Type-species: *Perdita albiovittata* Cockerell. Monotypic.
- Taxonomy: Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 347, 404-406 (redescription, key to included spp.). —Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 329 (modified key to included spp.). —Timberlake, 1958. Calif. Univ. Pubs. Ent. 384-385 (key to spp. allied to *melanochlora*). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 22-24 (key to females of included spp.).
- albiovittata** Cockerell. N. Mex., Ariz., south. Calif. (Colorado and Mojave Deserts); Mexico (Chihuahua, Coahuila, Durango). Pollen: Unknown, but visits flowers of *Aplopappus spinulosus*, *Baileya multiradiata*, *B. pleniradiata*, *Cevallia sinuata*, *Coldenia greggii*, *Eriogonum inflatum*, *Gutierrezia californica*, *G. lucida*, *Haplopappus acradenius*, *H. gracilis*, *Pectis papposa*, *Physalis*, *Stephanomeria*, *Verbesina encelioides*.  
*Perdita albiovittata* Cockerell, 1895. Acad. Nat. Sci. Phila., Proc. 47: 15. ♀.  
*Perdita laticeps* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 98. ♂.
- Taxonomy: Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 405, 406, 411, figs. 105, 106, 168 (key, geogr. and floral records, possible synonymy). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 23, 24 (synonymy, geogr. and floral record).
- amoena** Timberlake. Ariz. (Cochise and Santa Cruz Counties), Utah (Washington County); Mexico (Sonora).  
*Perdita amoena* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 330, figs. 287, 288, 336. ♂.
- Taxonomy: Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 385, 386. ♀ (key). —Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 132 (geogr. record). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 23, 24 (key, geographic records).
- annexa** Timberlake. N. Mex. (Pecos and Santa Fe). Pollen: Unknown, but visits flowers of *Hymenoxys richardsoni*.  
*Perdita annexa* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 133. ♂.
- Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 23, 24. ♀ (key).

**bradleyana** Timberlake. Tex. (Eagle Pass and El Paso); Mexico (Zacatecas).

*Perdita bradleyana* Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 409, figs. 99, 100, 165. ♂.

Taxonomy: Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 329. ♀. —Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 385 (key). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 23, 25 (key, geogr. record). —Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 7 (geogr. record).

**chrysophila chrysophila** Cockerell. Tex. (Culberson County). N. Mex. (Hollywood, Organ and Pecos), Ariz. (Safford); Mexico (Hidalgo, San Luis Potosi and Zacatecas). Pollen: Unknown, but visits flowers of *Flourensia*, *Hymenoxys*, *Picradenia floribunda*, *Verbesina encelioides*, *Zaluzania globosa*. Another subspecies, *Perdita chrysophila quadricincta* Timberlake, occurs in Mexico (Nuevo Leon).

*Perdita chrysophila* Cockerell, 1896. N. Y. Ent. Soc., Jour. 4: 206. ♂.

*Perdita nigrifacies* Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 406 ♀.

Taxonomy: Cockerell, 1904. Entomologist 37: 6. ♂. —Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 406, figs. 93, 94, 162 (key, type). —Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 386-387 (tax. characters, as *nigrifacies*). —Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 132-133, figs. 660, 661, 732. ♂ (redescription). —Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 95-96 (tax. characters, as *nigrifacies*). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 23, 25 (key, synonymy, geogr. and floral records).

**coahuilensis** Timberlake. Tex. (El Paso); Mexico (Coahuila).

*Perdita coahuilensis* Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 409, figs. 101, 102, 166. ♀, ♂.

Taxonomy: Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 329, 330 (key, geogr. record). —Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 385 (key). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 24 (key).

**idahoensis** Timberlake. Idaho (Cassia County), Calif. (Inyo County). Pollen: Unknown, but visits flowers of *Chrysothamnus*, *Gutierrezia microcephala*.

*Perdita idahoensis* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 385, figs. 464, 465, 517. ♂, ♀.

Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 23 (key). —Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 9 (geogr. and floral record).

**mandibularis** Timberlake. South. Calif. (Colorado and Mojave Deserts). Pollen: Unknown, but visits flowers of *Bebbia juncea*, *Chaenactis carphoclinia*, *Dalea*, *Geraea canescens*.

*Perdita mandibularis* Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 411, figs. 107, 108, 169. ♀, ♂.

Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 23 (key).

**melanochlora** Cockerell. Ariz. (Santa Rosa Valley and Tucson), south. Calif. (Colorado and Mojave Deserts), Nev. (Arden and Charleston Mts.). Pollen: Unknown, but visits flowers of *Baileya multiradiata*, *Bebbia juncea*, *Chrysothamnus*, *Encelia farinosa*, *Sphaeralcea*, *Viguiera deltoidea*, *V. nevadensis*.

*Perdita melanochlora* Cockerell, 1922. Amer. Mus. Novitates 33: 7. ♀.

Taxonomy: Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 405, 406, 408, figs. 97, 98, 164. ♀, ♂. —Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 329 (key). —Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 385 (key). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 23 (key). —Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 9 (geogr. records).

**nigroviridis** Timberlake. Tex. Pollen: Unknown, but visits flowers of *Gaillardia pulchella*, *Helenium*, *Helianthus annuus*.

*Perdita nigroviridis* Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 407, figs. 95, 96, 163. ♀, ♂.

Taxonomy: Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 386 (geogr. and floral records). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 23, 26 (key, geogr. and floral record).

#### Genus PERDITA Subgenus PERDITA Smith

*Perdita* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 128.

Type-species: *Perdita haliotoides* Smith. Monotypic.

*Neoperdita* Ashmead, 1899. Amer. Ent. Soc., Trans. 26: 85.

Type-species: *Perdita zebrata* Cresson. Monotypic and orig. desig.

*Perdita* subg. *Geoperdita* Cockerell and Porter, 1899. Ann. and Mag. Nat. Hist. (7) 4: 415.

Type-species: *Perdita chamaesarachae* Cockerell. Monotypic.

*Perdita* subg. *Tetraperdita* Cockerell and Porter, 1899. Ann. and Mag. Nat. Hist. (7) 4: 415.

Type-species: *Perdita sexmaculata* Cockerell. Monotypic and orig. desig.

*Zaperdita* Robertson, 1918. Ent. News 29: 91.

Type-species: *Perdita maura* Cockerell. Monotypic and orig. desig.

This is the largest subgenus of *Perdita*. Six groups of species are currently recognized and, although some of these groups have been divided into subgroups in the existing classification, no attempt has been made to reflect these subsidiary units in this catalog. The six recognized species groups are arranged in accordance with the current classification of this subgenus.

Revision: Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 303-365 (*zonalis* group).

—Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 365-374 (*halictoides* group). —Timberlake,

1960. Calif. Univ. Pubs. Ent. 17: 1-121 (*octomaculata* group). —Timberlake, 1960. Calif.

Univ. Pubs. Ent. 17: 135 (*halictoides* group). —Timberlake, 1962. Calif. Univ. Pubs. Ent.

28: 1-86 (*ventralis* group). —Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 1, 97-101 (*zonalis*

group). —Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 1, 101-102 (*halictoides* group).

—Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 1, 102-106 (*octomaculata* group).

—Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 106-107 (*valida* group). —Timberlake, 1964.

Calif. Univ. Pubs. Ent. 28: 1, 125-362 (*sphaeralceae* group). —Timberlake, 1968. Calif.

Univ. Pubs. Ent. 49: 40-57 (*zonalis* group). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49:

57-62 (*halictoides* group). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 62-95

(*octomaculata* group). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 95-112 (*ventralis*

group). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 112-161 (*sphaeralceae* group).

—Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 11-56 (suppl. studies on the species of the subgenus *Perdita*).

#### SPECIES GROUP ZONALIS

Taxonomy: Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 303-315 (tax. characters, key to included spp.). —Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 1, 97-101 (tax. characters, modified key to included spp.). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 40-43 (suppl. key to included spp.). —Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 11-13 (suppl. key to included spp.).

**accepta** Timberlake. Oreg. (Crook County).

*Perdita accepta* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 340. ♀.

**adjuncta** Timberlake. Nev. (Austin), Calif. (Modoc County), Oreg. (Lake County), Idaho (Bingham, Cassia and Elmore Counties). Pollen: Unknown, but visits flowers of *Chrysothamnus*.

*Perdita adjuncta* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 327, figs. 390, 391, 479. ♀, ♂.

Taxonomy: Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 97 (key).

**aemula aemula** Timberlake. Oreg., Utah. Pollen: Unknown, but visits flowers of *Chrysothamnus*, *Solidago*.

*Perdita aemula* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 330, figs. 396, 397, 482. ♂, ♀.

Taxonomy: Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 98 (key). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 42 (key).

**aemula quadrifasciata** Timberlake. Calif. (Mono County). Pollen: Unknown, but visits flowers of *Chrysothamnus*.

*Perdita aemula quadrifasciata* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 43. ♂, ♀.

**affecta** Timberlake. Ariz. (Tuba City). Pollen: Unknown, but visits flowers of *Artemisia filifolia*.

*Perdita affecta* Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 14. ♀.

**albopicta** Timberlake. Utah (Millard County). Pollen: Unknown, but visits flowers of *Chrysothamnus*.

*Perdita albopicta* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 341. ♀.

- ampla** Timberlake. N. Mex. (McKinley and San Juan Counties). Pollen: Unknown, but visits flowers of *Chrysothamnus nauseosus*, *Senecio*.  
*Perdita ampla* Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 14. ♀.
- bacharidis** Cockerell. Ariz. (Maricopa and Pima Counties), Calif. (Riverside and Imperial Counties). Pollen: Apparently an oligolege of *Baccharis* including *B. emoryi*, *B. sarothroides*.  
*Perdita bacharidis* Cockerell, 1900. Entomologist 33: 61. ♀.
- Taxonomy: Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 309, 313, 352-353, figs. 428, 429, 498. ♀, ♂ (redescription). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 44 (geogr. and floral records).
- basinicola** Timberlake. Nev. (Churchill County), Calif. (Inyo County).  
*Perdita basinicola* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 44, figs. 1213, 1214, 1310. ♂, ♀.
- chrysothamni** Timberlake. Calif. (Mojave Desert). Pollen: Apparently an oligolege of *Chrysothamnus nauseosus*.  
*Perdita chrysothamni* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 319, figs. 374, 375, 473. ♀, ♂.
- ciliata** Timberlake. North. Calif., Oreg., Idaho. Pollen: Unknown, but visits flowers of *Aster*, *Chrysothamnus nauseosus*, *Eriogonum*, *Gutierrezia*, *Haplopappus*, *Heterotheca grandiflora*, *Lessingia glandulifera*, *Melilotus alba*, *Senecio douglasii*, *Solidago occidentalis*. Predator: *Philanthus pacificus arizonae* Dunning.  
*Perdita interserta ciliata* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 334, figs. 404, 405, 486. ♀, ♂.
- Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 43, 45 (key, tax. status, geogr. records, variation).
- confinis** Timberlake. Calif. (Mono County).  
*Perdita confinis* Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 15. ♀.
- crassihirta** Timberlake. Wash. (Chelan County).  
*Perdita crassihirta* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 46. ♀.
- craterognatha** Timberlake. Calif. (Mono County).  
*Perdita craterognatha* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 46, figs. 1215, 1216, 1311. ♀, ♂.
- depressa** Timberlake. Utah (Monument Valley), Ariz. (Havas Canyon). Pollen: Unknown, but visits flowers of *Cleome jonesii*.  
*Perdita depressa* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 48, figs. 7, 1217, 1218, 1312. ♀, ♂.
- dicksoni** Timberlake. Calif. (Inyo County). Pollen: Unknown, but visits flowers of *Chrysothamnus albidus*.  
*Perdita dicksoni* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 328, figs. 392, 393, 480. ♀, ♂.
- Taxonomy: Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 97 (key).
- dubia dubia** Cockerell. Colo. (Garfield and Pitkin Counties), Ariz. (Yavapai County). Pollen: Unknown, but visits flowers of *Gutierrezia microcephala*, *G. sarothrae*.  
*Perdita dubia* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 75. ♂.  
*Perdita fraterna* Timberlake, 1929. N. Y. Ent. Soc., Jour. 39: 123. ♂.
- Taxonomy: Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 306, 312, 329, figs. 394, 395, 481. ♀, ♂ (redescription, key, as *fraterna*). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 43, 50 (key, tax. status). —Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 16-17 (tax. status, synonymy).
- dubia parilis** Timberlake. Ariz. (Coconino and Mohave Counties), Utah, Nev. (Clark County), Idaho (Cassia and Franklin Counties), Wyo. (Franklin County). Pollen: Unknown, but visits flowers of *Aplopappus*, *Chrysothamnus*, *Eriogonum*, *Gutierrezia*.  
*Perdita parilis* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 342, figs. 414, 415, 491. ♀, ♂.
- Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 42, 43, 52 (key, geogr. and floral records). —Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 17-18 (tax. status)

- ericameriae** Timberlake. South. Calif. (Los Angeles and Riverside Counties). Pollen: Unknown, but visits flowers of *Aplopappus palmeri* var. *pachylepis*, *Gutierrezia californica*, *Lepidospartum squamatum*.  
*Perdita ericameriae* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 317, figs. 372, 373, 472. ♀, ♂.
- festiva** Timberlake. Utah (Emery County).  
*Perdita festiva* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 321. ♀.
- Taxonomy: Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 98 (key).
- foleyi** Timberlake. Calif. (Kern and Tulare Counties). Pollen: Unknown, but visits flowers of *Chrysothamnus nauseosus*.  
*Perdita foleyi* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 347, figs. 418, 419, 493. ♀, ♂.
- Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 50 (geogr. and floral record).
- haigi** Timberlake. Nev. (Churchill County).  
*Perdita haigi* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 100, figs. 833, 834, 895. ♀, ♂.
- impunctifrons** Timberlake. Calif. (Inyo and San Bernardino Counties).  
*Perdita impunctifrons* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 355. ♀.
- Taxonomy: Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 18 (geogr. record).
- interserta** Cockerell. South. Calif. (cismontane and Mojave Desert). Pollen: Unknown, but visits flowers of *Aplopappus palmeri* var. *pachylepis*, *A. veneta* var. *vernonioides*, *Baccharis emoryi*, *Chrysothamnus nauseosus*, *Eschscholzia californica*, *Lepidospartum squamatum*, *Polygonum lophathifolium*, *Rhus diversiloba*, *Satureja occidentalis*, *Solidago occidentalis*.  
*Perdita interserta* Cockerell, 1922. U. S. Natl. Mus., Proc. 60 (18): 20. ♀.
- Taxonomy: Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 307, 311, 312, 333-334, figs. 402, 403, 485. ♂, ♀ (key, tax. characters, tax. status, geogr. and floral records). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 45 (tax. status).
- irregularis** Timberlake. N. Mex. (McKinley County). Pollen: Unknown, but visits flowers of *Chrysothamnus nauseosus*.  
*Perdita irregularis* Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 18, figs. 1367, 1368, 1402. ♀, ♂.
- isocomae** Timberlake. Calif. (Riverside). Pollen: Unknown, but visits flowers of *Aplopappus venetus* var. *vernonioides*, *Baccharis emoryi*, *Polygonum lophanthifolium*, *Solidago occidentalis*.  
*Perdita isocomae* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 335, figs. 408, 409, 488. ♂, ♀.
- lepidosparti lepidosparti** Timberlake. Calif. (Mojave Desert and Lassen County), Nev. (Washoe County), Idaho (Bingham, Cassia, Fremont and Owyhee Counties). Pollen: Unknown, but visits flowers of *Chrysothamnus*, *Eriogonum heermannii*, *Gutierrezia lucida*, *Lepidospartum squamatum*, *Tetradymia comosa*.  
*Perdita lepidosparti lepidosparti* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 325, figs. 386, 387, 478. ♂, ♀.
- Taxonomy: Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 98 (key). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 50 (geogr. and floral records).
- lepidosparti novella** Timberlake. South. Calif. (San Bernardino and San Gabriel Mts.).  
*Perdita lepidosparti novella* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 326, figs. 388, 389. ♀, ♂.
- Taxonomy: Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 98 (key).
- lompocensis** Timberlake. Calif. (Lompoc).  
*Perdita lompocensis* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 337, figs. 410, 411, 489. ♂, ♀.
- melanderi** Timberlake. Calif. (Morro Bay).  
*Perdita melanderi* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 50, fig. 8. ♀.
- munda** Timberlake. Utah, Ariz. (Apache County).  
*Perdita munda* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 340. ♀.

**nigrocincta** Timberlake. Calif. (Mono County).

*Perdita nigrocincta* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 351. ♀.

**obispoensis** Timberlake. Calif. (San Luis Obispo County).

*Perdita obispoensis* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 335, figs. 406, 407, 487. ♂.

**oregonensis expleta** Timberlake. Calif. (Sierra Nevada Mts.). Pollen: Unknown, but visits flowers of *Chrysothamnus*.

*Perdita oregonensis expleta* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 99. ♀.

**oregonensis oregonensis** Timberlake. Wash. and Idaho, south to Calif. and Nev. Pollen:

Unknown, but visits flowers of *Chrysothamnus viscidiflorus*, *Gutierrezia*.

*Perdita oregonensis* Timberlake, 1929. Pan-Pacific Ent. 6: 52. ♂.

Taxonomy: Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 306, 311, 320-321, figs. 378, 379, 475.

♀, ♂ (key, redescription, geogr. and floral records). — Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 98 (key, tax. status). — Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 41, 52 (geogr. and floral records).

**pallidiventris** Timberlake. Calif. (Fresno County). Pollen: Unknown, but visits flowers of *Eriogonum fasciculatum*.

*Perdita pallidiventris* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 99. ♀.

**placida** Timberlake. Calif. (Inyo County).

*Perdita placida* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 339. ♀.

Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 42 (key).

**polita** Timberlake. Calif. (Kings, Tulare and Stanislaus Counties). Pollen: Unknown, but visits flowers of *Hemizonia pungens*.

*Perdita polita* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 332, figs. 400, 401, 484. ♀, ♂.

**primula** Timberlake. Calif. (Indio). Pollen: Unknown, but visits flowers of *Melilotus alba*.

*Perdita primula* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 347, figs. 420, 421, 494. ♂.

**proxima** Timberlake. Calif. (Mohave Desert). Pollen: Unknown, but visits flowers of

*Chrysothamnus nauseosus*, *C. n. consimilis*, *Cleomella obtusifolia*, *Haplopappus acradenius*, *Solidago occidentalis*.

*Perdita proxima* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 322, figs. 380, 381, 476. ♀, ♂.

Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 52 (geogr. and floral records).

**punctifrons** Timberlake. Calif. (Los Angeles and San Bernardino Counties). Pollen: Unknown, but visits flowers of *Lessingia germanorum* var. *glandulifera*.

*Perdita punctifrons* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 350, figs. 426, 427, 497. ♀, ♂.

**repens** Timberlake. Calif. (Mt. Hamilton). Pollen: Unknown, but visits flowers of *Haplopappus arborescens*.

*Perdita repens* Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 19, figs. 1369, 1370, 1403. ♂.

**rivalis** Timberlake. Calif. (San Bernardino, San Gabriel and Sierra Nevada Mts.), Nev.

(Daggett Pass). Pollen: Unknown, but visits flowers of *Aster adscendens*, *A. canescens*, *Erigeron divergens*, *E. foliolosus* var. *stenophyllus*, *Gayophytum heterozygus*, *G. nuttallii*.

*Perdita rivalis* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 349, figs. 424, 425, 496. ♀, ♂.

Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 43, 52 (key, geogr. and floral records).

**scotti** Timberlake. Calif. (Inyo, Los Angeles and Kern Counties). Pollen: Unknown, but visits flowers of *Chrysothamnus nauseosus*.

*Perdita scotti* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 338, figs. 412, 413, 490. ♀, ♂.

Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 53 (geogr. and floral records).

**similis pascoensis** Timberlake. Wash. (Pasco).

*Perdita similis pascoensis* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 324, figs. 384, 385. ♂, ♀.

**similis similis** Timberlake. Oreg., Idaho, and Wyo., south to N. Mex., Ariz. and south. Calif. (Inyo, Riverside and Imperial Counties). Pollen: Unknown, but visits flowers of



*Chrysothamnus nauseosus*, *C. viscidiflorus*, *Cleome serrulata*, *Erigeron*, *Gutierrezia sarothrae*, *Haplopappus heterophyllus*, *Prosopis juliflora*.

*Perdita similis similis* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 323, figs. 382, 383, 477. ♀, ♂.

Taxonomy: Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 22 (collection site). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 41, 53 (key, geogr. records, floral preferences).

**ocia** Timberlake. Calif. (Inyo County).

*Perdita socia* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 42, 43, 53-54, plate figs. 1219, 1220, 1313. ♀, ♂.

**stottleri** Cockerell. Sask., south to N. Mex. west to Idaho, Nev. and Calif. (Mono County).

Pollen: Unknown, but visits flowers of *Aster*, *Chrysothamnus graveolens*, *C. g. var. glabrata*, *C. nauseosus*, *Gutierrezia sarothrae*, *Solidago missouriensis*.

*Perdita stottleri* Cockerell, 1896. N. Y. Ent. Soc., Jour. 4: 205. ♀.

*Perdita stottleri flvida* Swenk and Cockerell, 1907. Ent. News 18: 58. ♀, ♂.

Taxonomy: Cockerell, 1904. Entomologist 37: 6. ♂. —Timberlake, 1958. Calif. Univ. Pubs.

Ent. 14: 304, 310, 315 (tax. characters, key, geogr. and floral records). —Timberlake, 1958.

Calif. Univ. Pubs. Ent. 14: 304, 306, 310, 315-316, figs. 368, 369, 470 (tax. characters, key,

geogr. and floral records, as *stottleri flvida*). —Timberlake, 1962. Calif. Univ. Pubs. Ent.

28: 98 (key, as *stottleri flvida*). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 54

(synonymy, geogr. and floral records).

**subvestita** Timberlake. N. Mex. (Citron County), Ariz. (Coconino County), Utah (Kane County).

Pollen: Unknown, but visits flowers of *Aplopappus gracilis*, *Chrysothamnus viscidiflorus*, *Gutierrezia microcephala*.

*Perdita subvestita* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 55, figs. 1221, 1222, 1314.

♀, ♂.

**swezeyi** Timberlake. Calif., Nev. (Ormsby County). Pollen: Unknown, but visits flowers

*Chrysothamnus*, *Erigeron ramosus*.

*Perdita swezeyi* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 348, figs. 422, 423, 495. ♀, ♂.

**taeniata** Timberlake. N. Mex. (McKinley and San Juan Counties). Pollen: Unknown, but visits flowers of *Chrysothamnus nauseosus*, *Senecio longi*.

*Perdita taeniata* Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 20, figs. 1371, 1372, 1404. ♀, ♂.

**toschiae** Timberlake. Nev. (Douglas County).

*Perdita toschiae* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 56. ♀.

**townsendi** Cockerell. N. Mex. (Otero and Rio Arriba Counties), Ariz. (Apache County). Pollen:

Unknown, but visits flowers of *Aster*, *Chrysothamnus*, *Haplopappus heterophyllus*.

*Perdita townsendi* Cockerell, 1896. N. Y. Ent. Soc., Jour. 4: 204. ♀, ♂.

Taxonomy: Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 305, 310, 320, figs. 376, 377, 474 (tax. characters, geogr. and floral records). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 56

(geogr. and floral records).

**vestita** Timberlake. Utah (Grand and Kane Counties), Ariz. (Coconino County). Pollen:

Unknown, but visits flowers of *Chrysothamnus*, *Gutierrezia*.

*Perdita vestita* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 316, figs. 370, 371, 471. ♀, ♂.

Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 41, 42, 57 (key, geogr. and floral records).

**zonalis aequalis** Timberlake. Oreg., northern Calif., ?Nev., ?Mont. Pollen: Unknown, but visits flowers of *Chrysothamnus* including *C. nauseosus speciosus*, *Solidago*.

*Perdita zonalis aequalis* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 344. ♀, ♂.

**zonalis bernardina** Timberlake. Calif. (Bear Valley and Santa Ana Canyon in San Bernardino

Mts.). Pollen: Unknown, but visits flowers of *Aster canescens*, *Chrysothamnus*

*nauseosus*, *C. viridulus*, *C. viscidiflorus*, *Eriogonum molestum* var. *dauidsonii*, *E.*

*wrightii* var. *subscapsum*, *Gutierrezia californica*, *G. lucida*, *Solidago californica*.

*Perdita zonalis bernardina* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 345, figs. 416, 417, 492. ♀, ♂.

**zonalis monticola** Timberlake. Calif. (Sierra, Shasta, Nevada, Plumas and Placer Counties).

Pollen: Unknown, but visits flowers of *Chrysothamnus*, *Solidago*.

*Perdita zonalis monticola* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 345. ♀, ♂.

**zonalis pallescens** Timberlake. Calif. Pollen: Unknown, but visits flowers of *Gutierrezia lucida*, *Haplopappus acradenius*.

*Perdita zonalis pallescens* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 344. ♀, ♂.

**zonalis zonalis** Cresson. Calif. (Riverside and Kern Counties). Pollen: Unknown, but visits flowers of *Eriogonum*, *Gutierrezia californica*, *Lepidospartum squamatum*.

*Perdita zonalis* Cresson, 1879. Amer. Ent. Soc. Trans. 7: 202. ♀.

Taxonomy: Timberlake, 1929. Pan-Pacific Ent. 6: 49. ♀, ♂. —Timberlake, 1958. Calif. Univ.

Pubs. Ent. 14: 308, 313, 343-344 (key, redescription, geogr. and floral records).

—Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 41, 43 (key).

#### SPECIES GROUP HALICTOIDES

The species of this group collect pollen from flowers of the solanaceous genera *Physalis* and *Chamaesaracha*, but visit these and other flowers for nectar.

Taxonomy: Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 365-367 (tax. characters, key to included spp.). —Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 1 (key). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 57-59 (key to included spp.).

**beameri** Timberlake. Tex. Pollen: Collects pollen from the flowers of *Chamaesaracha* including *C. conioides*, but visits other flowers for nectar including *Astragalus*, *Gilia acerosa*, *Physalis lobata*.

*Perdita beameri* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 276, figs. 56, 1041, 1042, 1164. ♀, ♂.

Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 57, 59 (key, geogr. and floral records).

**chamaesarachae** Cockerell. N. Mex. (Albuquerque, High Rolls, Las Vegas, Roswell and Santa Fe), Ariz. (Cochise and Yavapai Counties); Mexico (Durango). Pollen: Apparently collects pollen from the flowers of *Chamaesaracha coronopus*, but visits other flowers including *Physalis*.

*Perdita chamaesarachae* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 65. ♂, ♀.

Taxonomy: Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 367, 371, figs. 450, 451, 509 (key, redescription, geogr. and floral records). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 58, 59 (key).

**fidissima** Timberlake. Tex. (Kenedy County). Pollen: Unknown, but visits flowers of *Parkinsonia*.

*Perdita fidissima* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 59. ♀.

**halictoides** Smith. Wis., Mich. and Ind., west to N. Dak., Colo., and Tex.; Fla. Pollen: Unknown, but visits flowers of *Euphorbia nuttallii*, *Gaillardia*, *Monarda punctata* var. *occidentalis*, *Physalis heterophylla*, *P. lanceolata*, *Solidago*.

*Perdita halictoides* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 128. ♀.

*Perdita sexmaculata* var. *punctata* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 71. ♀.

*Perdita maura* Cockerell, 1901. Entomologist 34: 191. ♂, ♀.

*Perdita bisignata* Cockerell, 1922. Amer. Mus. Novitates 33: 11. ♀.

Taxonomy: Cockerell, 1904. Canad. Ent. 36: 303. —Timberlake, 1928. Hawaii. Ent. Soc., Proc. 7: 155. —Cockerell, 1922. Ann. and Mag. Nat. Hist. (9) 10: 268 (tax. characters, as *maura*).

—Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 366, 367, 370-371, figs. 448, 449, 508

(redescription, key, geogr. and floral records, as *maura*). —Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 366, 371. ♀ (key, redescription).

—Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 135 (synonymy, geogr. records). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 318-319, figs. 76-79, table 9 (redescription, synonymy).

—Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 57, 58 (key).

**lenis** Timberlake. Tex., N. Mex., Ariz., Calif. (Indio). Pollen: Unknown, but visits flowers of *Baileya multiradiata*, *Chamaesaracha conioides*, *Physalis heterophylla*, *Verbesina encelioides*.

*Perdita lenis* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 372, figs. 452, 453, 510. ♀, ♂.

Taxonomy: Rozen, 1966. Amer. Mus. Novitates 2259: 19, figs. 47-49 (larva). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 58, 59 (key). —Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 22 (geogr. and floral records).

**levigata** Timberlake. Colo. (Fremont County). Pollen: Unknown, but visits flowers of *Physalis*.

*Perdita levigata* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 60, figs. 1225, 1226, 1316. ♂.

**missionis** Timberlake. Tex.; Mexico (Tamaulipas, San Luis Potosi). Pollen: Unknown, but visits flowers of *Chamaesaracha conioides*, *Lesquerella*, *Physalis lobata*.

*Perdita missionis* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 369, figs. 446, 447, 507. ♂, ♀.

Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 58 (key).

**physalidis** Timberlake. Calif. (Riverside County), Ariz. (Continental). Pollen: Unknown, but visits flowers of *Physalis*, including *P. crassifolia*.

*Perdita physalidis* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 374, figs. 454, 455, 511. ♀, ♂.

Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 58, 59, 61 (key, geogr. and floral records).

**rozeni** Timberlake. Calif. (Colorado Desert); Mexico (Baja California and Sonora). Pollen: Unknown, but visits flowers of *Boerhaavia*, *Dalea mollis*.

*Perdita rozeni* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 61, figs. 1227, 1228, 1317. ♀, ♂.

**sexmaculata** *sexmaculata* Cockerell. Ariz., N. Mex., Tex., Kans., Colo.; Mexico (Chihuahua, Durango, Hidalgo). Pollen: Unknown, but visits flowers of *Astragalus*, *Chamaesaracha conioides*, *C. coronopus*, *Phacelia piperi*, *Physalis lobata*, *Prosopis*, *Scutellaria*, *Sphaeralcea albicaulis*, *Thelesperma gracile*. Another subspecies, *Perdita sexmaculata octonaria* Timberlake, occurs in Baja California, Mexico.

*Perdita sexmaculata* Cockerell, 1895. Acad. Nat. Sci. Phila., Proc. 47: 12. ♀.

*Perdita anograe* Cockerell, 1902. Amer. Nat. 36: 812. ♂.

Taxonomy: Cockerell and Porter, 1899. Ann. and Mag. Nat. Hist. (7) 4: 416. ♀, ♂.

—Timberlake, 1929. N. Y. Ent. Soc., Jour. 37: 118. ♂. —Timberlake, 1951. In Muesebeck, Krombein and Townes, U. S. Dept. Agr., Agr. Monog. 2: 1095 (synonymy). —Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 366, 367-369, figs. 444, 445, 506 (key, redescription).

—Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 101 (tax. status). —Rozen, 1966. Amer.

Mus. Novitates 2259: 20-21, fig. 51 (larva, as *sexmaculata*?). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 58 (key).

Biology: Rozen, 1967. Amer. Mus. Novitates 2297: 38-40, figs. 16, 18, table 1 (nest architecture, life history).

#### SPECIES GROUP OCTOMACULATA

Taxonomy: Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 1-22 (tax. characters, key to included spp.). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 62-67 (suppl. key to included spp.). —Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 22-25 (suppl. key to included spp.).

**abdominalis** Timberlake. South. Calif. (Colorado Desert); Mexico (Baja California). Pollen: Unknown, but visits flowers of *Aplopappus*, *Heliotropium curassavicum*, *Pectis papposa*.

*Perdita abdominalis* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 38, figs. 550, 551, 667. ♀, ♂.

Taxonomy: Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 26 (geogr. and floral records).

**affinis** Cresson. Colo., N. Mex., Ariz. Pollen: Unknown, but visits flowers of *Aplopappus gracilis*, *Grindelia inornata*, *G. squarrosa*, *Helianthus petiolaris*, *Solidago*.

*Perdita affinis* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 69. ♀, ♂.

- Taxonomy: Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 11, 21, 108-109, figs. 636, 637, 720 (redescription, geogr. and floral records).
- albipes** Timberlake. Tex. (Big Bend National Park).
- Perdita albipes* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 102, figs. 837, 838, 897. ♂.
- apacheorum** Timberlake. N. Mex. (Hidalgo County), Wyo. (Johnson County), Ariz. (Cochise and Mohave Counties). Pollen: Unknown, but visits flowers of *Asclepias*, *Baccharis*, *Euphorbia*, *Grindelia squarrosa*, *Gutierrezia sarothrae*, *Heterotheca*.
- Perdita apacheorum* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 99. ♀.
- Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 67-68. ♂ (geogr. and floral records).
- aperta** Timberlake. N. Mex. (Lincoln County), Ariz. (Navajo County). Pollen: Unknown, but visits flowers of *Gutierrezia microcephala*, *Lepidium montanum*.
- Perdita aperta* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 68, figs. 9, 1231, 1232, 1319. ♂.
- aplopappi** Timberlake. Ariz., Utah (Beaver and Washington Counties). Pollen: Unknown, but visits flowers of *Aplopappus gracilis*, *Eriogonum*, *Gutierrezia microcephala*.
- Perdita aplopappi* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 98, figs. 626, 627, 715. ♀, ♂.
- Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 69 (geogr. and floral record).
- aridella** Timberlake. Utah, Ariz. (Navajo County). Pollen: Unknown, but visits flowers of *Gutierrezia sarothrae*, *Helianthus*.
- Perdita aridella* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 81, figs. 600, 601, 702. ♀, ♂.
- atriventris** Timberlake. Tex. (Calvert). Pollen: Unknown, but visits flowers of *Heterotheca subaxillaris*.
- Perdita atriventris* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 111, figs. 640, 641, 722. ♂.
- beatula** Timberlake. Nev. (Churchill, Humboldt and Washoe Counties). Pollen: Unknown, but visits flowers of *Sphaeralcea*.
- Perdita beatula* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 22, figs. 522, 523, 662. ♂.
- Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 62, 69-70. ♀ (geogr. and floral records).
- bigeloviae** Cockerell. Tex. (El Paso County), N. Mex., Colo. (Bent and Logan Counties). Pollen: Unknown, but visits flowers of *Aplopappus heterophyllus*, *A. pleuriflorus*.
- Perdita bigeloviae* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 87. ♂, ♀.
- Perdita fasciata* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 57. ♀.
- Taxonomy: Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 15, 71-72, figs. 588, 589, 696 (redescription). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 70 (synonymy, geogr. and floral records).
- biparticeps** Cockerell. N. Mex. Pollen: Unknown, but visits flowers of *Pectis papposa*.
- Perdita biparticeps* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 84. ♂.
- Taxonomy: Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 121 (tax. characters). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 66, 70. ♂ (type, redescription).
- bridwelli** Timberlake. Ariz. (Yuma County), south. Calif. (Colorado Desert). Pollen: Unknown, but visits flowers of *Sphaeralcea* including *S. emoryi*, *S. orcuttii*.
- Perdita bridwelli* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 34, figs. 542, 543, 673. ♀, ♂.
- bruneri** Cockerell. Tex. to Man. and Alta. east of Rocky Mts. Pollen: Unknown, but visits flowers of *Aplopappus divaricatus*, *Boltonia asteroides*, *Cleome serrulata*, *Grindelia squarrosa*, *Solidago altissima*, *S. rigida*.
- Perdita bruneri* Cockerell, 1897. Ent. News 8: 23. ♂ (? misdet.).
- Perdita Cockerelli* Crawford, 1906. Canad. Ent. 38: 282. ♂, ♀.
- Taxonomy: Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 11, 21, 101-103, figs. 628, 629, 716 (redescription, geogr. and floral records).
- butleri** Timberlake. Ariz. (Gila Bend and Salome). Pollen: Unknown, but visits flowers of *Hymenothrix wislizeni*, *Pectis papposa*.
- Perdita butleri* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 96, figs. 624, 625, 714. ♀, ♂.

- chloris** Timberlake. Ariz. (Yuma County), Nev. (Churchill and Lyon Counties), Calif. (Imperial and Inyo Counties). Pollen: Unknown, but visits flowers of *Dalea polyadenia*, *Sphaeralcea*.  
*Perdita chloris* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 64, figs. 576, 577, 690. ♀, ♂.
- claripennis** Timberlake. N. Mex. (Dona Ana County).  
*Perdita claripennis* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 71. ♀.
- cognata** Timberlake. Wyo. (Sweetwater County), Utah (Grand County). Pollen: Unknown, but visits flowers of *Chrysothamnus*.  
*Perdita cognata* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 93, figs. 616, 617, 710. ♂.
- Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 67, 71-72. ♀, ♂ (redescription, key, tax. status, geogr. and floral records).
- congrua** Timberlake. Tex. (Marathon). Pollen: Unknown, but visits flowers of *Gutierrezia*.  
*Perdita congrua* Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 26, figs. 1373, 1374, 1405. ♂.
- consobrina** **consobrina** Timberlake. N. C., S. C. Pollen: Unknown, but visits flowers of *Chrysopsis*, *Gerardia*, *Haplopappus*, *Heterotheca*, *Kuhnistera*.  
*Perdita consobrina* Timberlake, 1928. Amer. Mus. Novitates 321: 3. ♀.
- Taxonomy: Timberlake, 1952. Ent. Soc. Wash., Proc. 54: 202-203. ♂. —Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 12, 21, 109-111, figs. 638, 639, 721. ♀, ♂ (redescription).  
 —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 315, figs. 76-79, table 9 (redescription).
- consobrina lepida** Timberlake. Fla. (Dunedin, Lake Worth).  
*Perdita consobrina lepida* Timberlake, 1952. Ent. Soc. Wash., Proc. 54: 203. ♀, ♂.
- Taxonomy: Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 12, 21, 111. —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 315-316 (redescription).
- croceipes** Timberlake. N. Mex. (Eddy and Socorro Counties), Ariz. (Mohave and Yavapai Counties), Utah (Kane County). Pollen: Unknown, but visits flowers of *Baileya*, *Gutierrezia* including *G. microcephala*.  
*Perdita croceipes* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 72, figs. 590, 591, 697. ♂.
- Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 64, 66, 72-73. ♀ (key, geogr. and floral records).
- crotonis caerulea** Timberlake. Utah (St. George), Nev. (Glendale). Pollen: Apparently an oligolege of *Croton* including *C. longipes*.  
*Perdita crotonis caerulea* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 47. ♂.
- Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 73 (key).
- crotonis crotonis** Cockerell. N. Mex., Ariz. (Maricopa County); Mexico (Chihuahua). Pollen: Apparently an oligolege of *Croton*.  
*Perdita crotonis* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 64. ♀, ♂.
- Taxonomy: Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 5, 17, 43-44, figs. 558, 559, 681 (redescription, geogr. and floral records). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 73 (key).
- crotonis cucullata** Timberlake. Calif. (Anza). Pollen: Apparently an oligolege of *Croton* including *C. californicus*.  
*Perdita crotonis cucullata* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 46. ♀, ♂.
- Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 73 (key).
- crotonis decipiens** Timberlake. Tex. (Victoria).  
*Perdita crotonis decipiens* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 48. ♀, ♂.
- crotonis dilucida** Timberlake. Ariz., possibly Kans. and Nebr. Pollen: Presumably an oligolege of *Croton*, but visits flowers of *Euphorbia*.  
*Perdita crotonis dilucida* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 47. ♀, ♂.
- Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 73 (key).
- crotonis juabensis** Timberlake. Utah (Juab County). Pollen: Apparently an oligolege of *Croton*, visits flowers of *C. texensis*.  
*Perdita crotonis juabensis* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 103. ♀, ♂.

- crotonis leucoptera** Timberlake. South. Calif. (Riverside, San Diego and San Bernardino Counties). Pollen: Apparently an oligolege of *Croton californicus*, but also visits flowers of *Hoffmanseggia* presumably for nectar.
- Perdita crotonis leucoptera** Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 45. ♀, ♂.
- crotonis perpicta** Timberlake. Nebr., N. Mex. (Arriba County). Pollen: Presumably an oligolege of *Croton*, but visits flowers of *Eriogonum*, *Euphorbia marginata*.
- Perdita crotonis perpicta** Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 74. ♀, ♂.
- crotonis subnitens** Timberlake. Kans. (Reno County). Pollen: Apparently an oligolege of *Croton*, visits flowers of *C. monanthogynus*.
- Perdita crotonis subnitens** Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 48. ♀.
- crotonis titusi** Timberlake. Calif. (Chino).
- Perdita crotonis titusi** Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 46. ♀, ♂.
- crotonis undecimalis** Cockerell. N. Mex. (San Miguel County). Pollen: Presumably an oligolege of *Croton*, visits flowers of *Croton* sp.
- Perdita crotonis undecimalis** Cockerell, 1916. Ann. and Mag. Nat. Hist. (8) 17: 281. ♀.
- Taxonomy: Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 5, 45. ♀ (key, redescription).
- dalyi** Timberlake. Tex. (El Paso). Pollen: Unknown, but visits flowers of *Haplopappus heterophyllus*.
- Perdita dalyi** Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 119. ♀.
- dilecta** Timberlake. Utah (Kane County), Tex. (El Paso).
- Perdita dilecta** Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 40, figs. 554, 555, 679. ♀, ♂.
- discreta** Timberlake. N. C. (coastal plains and sand dunes). Pollen: Unknown, but visits flowers of *Haplopappus*.
- Perdita discreta** Timberlake, 1954. Ent. News 65: 14. ♀.
- Taxonomy: Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 12, 22, 115-116, figs. 646, 647, 725. ♂, ♀ (key, redescription, geogr. and floral records). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 76, 77 table 9 (redescription).
- dolichocephala** Swenk and Cockerell. Nebr., Kans., Colo. (Weld County). Pollen: Unknown, but visits flowers of *Amorpha canescens*, *Baltania asteroides*, *Euphorbia*, *Helianthus petiolaris*, *H. subrhomboides*, *Heterotheca subaxillaris*.
- Perdita dolichocephala** Swenk and Cockerell, 1907. Ent. News 18: 54. ♀.
- Perdita wunderi** Cockerell, 1922. Amer. Mus. Novitates 33: 10. ♀.
- Taxonomy: Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 12, 19, 116-117, figs. 648, 649, 726. ♀, ♂ (redescription, geogr. and floral records). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 74 (synonymy, tax. characters).
- electa** Timberlake. Wyo (Sweetwater County). Pollen: Unknown, but visits flowers of *Chrysothamnus nauseosus*.
- Perdita electa** Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 86. ♀.
- elegans** Timberlake. Calif. (Colorado Desert), Ariz. (Yuma). Pollen: Unknown, but visits flowers of *Abronia*, *Larrea tridentata*, *Palafoxia linearis*, *Pectis papposa*.
- Perdita elegans** Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 55, figs. 568, 569, 686. ♀, ♂.
- fallax** Cockerell. Tex. to Ariz., north to Nebr. and Mont. Pollen: Unknown, but visits flowers of *Baileya*, *Eriogonum*, *Grindelia*, *Gutierrezia*, *Helianthus* including *H. petiolaris*, *Heterotheca*, *Verbesina encelioides*. Predator: *Philanthus crabroniformis* Smith, *P. pacificus arizonae* Dunning.
- Perdita fallax** Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 90. ♀.
- Perdita erigeronis** Cockerell, 1897. Ann. and Mag. Nat. Hist. (6) 19: 398. ♂.
- Perdita fallax fontis** Cockerell, 1922. Amer. Mus. Novitates 33: 9. ♀.
- Taxonomy: Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 11, 20, 106-108, figs. 634, 635, 719 (key, redescription, geogr. and floral records). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 65, 74-75 (key, synonymy, variation, geogr. and floral records).
- flavicauda** Timberlake. Calif. (Colorado Desert). Pollen: Unknown, but visits flowers of *Larrea tridentata*, *Melilotus*, *Nama hispidum*, *Sphaeralcea*.
- Perdita flavicauda** Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 39. ♀
- (Misspelled *flavicauda flavicauda* in key, p. 4).

*Perdita flavicauda formosa* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 40. ♀ (Misspelled *flavicauda formosa* in key, p. 4).

Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 63, 66, 75-76, figs. 1233, 1234, 1320. ♂, ♀ (key, synonymy, tax. characters, geogr. and floral records).

**flaviceps** Timberlake. Nev. (Las Vegas).

*Perdita flaviceps* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 37, figs. 548, 549, 676. ♂.

**flavifrons** Timberlake. N. Mex. (Carrizozo), Utah (Lucia), south. Calif. (Colorado Desert).

Pollen: Unknown, but visits flowers of *Chrysothamnus*, *Gutierrezia microcephala*.

*Perdita flavifrons* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 76, figs. 1235, 1236, 1321. ♂.

**fuscipes** Timberlake. N. Mex. (Arch in Roosevelt County).

*Perdita fuscipes* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 77. ♀.

**gerardiae** Crawford. N. C., Fla., Miss. Pollen: Apparently an oligolectic of *Gerardia* including *G. fasciculata*, *G. purpurea*.

*Perdita gerardiae* Crawford, 1932. Ent. Soc. Wash., Proc. 34: 75. ♂, ♀.

Taxonomy: Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 13, 18, 68, figs. 582, 583, 693. ♀, ♂ (redescription). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 317, figs. 76-79, table 9 (redescription).

**gerhardi dallasiana** Cockerell. Tex. Pollen: Unknown, but visits flowers of *Aster tanacetifolius*, *Dalea aurea*, *Helianthus annuus*, *Monarda citriodora*, *M. punctata*.

*Perdita dallasiana* Cockerell, 1906. Entomologist 39: 178. ♂.

Taxonomy: Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 13, 14, 15, 28-29. ♀, ♂ (redescription, tax. status, geogr. and floral records).

**gerhardi gerhardi** Viereck. Wis., Ill., Ind. Pollen: Unknown, but visits flowers of *Monarda punctata*.

*Perdita gerhardi* Viereck, 1904. Ent. News 15: 21. ♀, ♂.

*Perdita gerhardi arenicola* Timberlake, 1929. N. Y. Ent. Soc., Jour. 37: 119. ♀, ♂.

Taxonomy: Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 2, 3, 13, 27-28 (redescription, synonymy, geogr. range). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 317-318 (redescription, as *gerhardi gerhardi* and *g. arenicola*).

**gerhardi monardae** Viereck. N. J., Va., Fla. Pollen: Unknown, but visits flowers of *Monarda punctata*.

*Perdita monardae* Viereck, 1904. Ent. News 15: 22. ♀, ♂.

Taxonomy: Timberlake, 1952. Ent. Soc. Wash., Proc. 54: 204 (tax. status). —Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 7, 15, 28 (redescription). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 318, figs. 76, 77, table 9 (redescription).

**gutierreziae** Cockerell. Colo., Tex., N. Mex., Ariz., Calif. (Mojave Desert). Pollen: Unknown, but visits flowers of *Baileya pleniradiata*, *Chrysothamnus*, *Gutierrezia lucida*, *G. microcephala*, *Haplopappus acradenius*, *H. heterophyllus*, *Solidago confinis*, *Sphaeralcea*.

*Perdita gutierreziae* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 85. ♂.

Taxonomy: Swenk and Cockerell, 1907. Ent. News 18: 56. ♂, ♀. —Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 8, 16, 74-76, figs. 594, 595, 699. ♀, ♂ (key, redescription, geogr. and floral records). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 65, 77-78 (tax. status, geogr. and floral records).

**halli** Timberlake. Calif. (Palm Springs).

*Perdita halli* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 89, figs. 612, 613, 708. ♀, ♂.

**hirsuta** Cockerell. N. Mex., Ariz. (Willcox). Pollen: Unknown, but visits flowers of *Dalea* including *D. scoparia*.

*Perdita hirsuta* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 79. ♂.

Taxonomy: Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 8, 18, 66, figs. 580, 581, 692. ♀, ♂ (redescription).

**hirtella** Timberlake. Utah (Wasatch County).

*Perdita hirtella* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 78, fig. 10. ♀.

**hirticeps apicata** Timberlake. Calif. (Colorado and Mojave Deserts), Ariz. (Mohave County), Utah (Cornish and Oak City). Pollen: Collects pollen from flowers of *Stephanomeria* including *S. exigua*, *S. pauciflora*, but visits these and other flowers for nectar including *Malacothrix glabrata*.

*Perdita hirticeps apicata* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 59. ♀, ♂.

*Perdita hirticeps candidipennis* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 60. ♀.

Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 79 (tax. characters, as *hirticeps apicata* and *h. candidipennis*). —Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 28 (synonymy, geogr. and floral record).

**hirticeps hirticeps** Timberlake. Calif. (cismontane). Pollen: Collects pollen from the flowers of *Stephanomeria* including *S. exigua*, *S. e.* var. *coronaria*, *S. virgata*, but visits these and other flowers for nectar including *Coreopsis lanceolata*, *Hemizonia*.

*Perdita hirticeps hirticeps* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 58, figs. 570, 571, 687. ♀, ♂.

Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 79 (tax. characters, variation).

**hirticeps luteocincta** Timberlake. Calif. (Antioch). Pollen: Unknown, but visits flowers of *Gutierrezia californica*.

*Perdita hirticeps luteocincta* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 60. ♀.

**indioensis** Timberlake. Calif. (Indio). Parasite: *Neolarra vigilans* (Ckll.). Pollen: Unknown, but visits flowers of *Haplopappus acradenius*.

*Perdita indioensis* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 54, figs. 566, 567, 685. ♀, ♂.

Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 63 (key).

**idonea** Timberlake. Utah, Ariz. (Coconino County). Pollen: Unknown, but visits flowers of *Gutierrezia*.

*Perdita idonea* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 79, figs. 1237, 1238, 1322. ♀, ♂.

**jonesi** Cockerell. Tex., Kans. Pollen: Unknown, but visits flowers of *Dalea aurea*, *Monarda citriodora*, *M. punctata*, *Petalostemon multiflorum*.

*Perdita jonesi* Cockerell, 1906. Entomologist 39: 177. ♀, ♂.

*Perdita birkmanni* Cockerell, 1916. Ann. and Mag. Nat. Hist. (8) 17: 282. ♀.

Taxonomy: Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 12, 22, 114-115, figs. 644, 645, 724 (redescription, synonymy, geogr. and floral records).

**knowltoni** Timberlake. Utah (Moab). Pollen: Unknown, but visits flowers of *Chrysothamnus*.

*Perdita knowltoni* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 51, figs. 562, 563, 683. ♀ (♂ misdet.).

Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 63, 80 (key, tax. status, geogr. and floral record).

**labergei** Timberlake. Kans. (Hutchinson). Pollen: Unknown, but visits flowers of *Euphorbia*.

*Perdita labergei* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 41, figs. 556, 557, 680. ♀, ♂.

**lasiogastra** Timberlake. Tex. (Cameron County), N. Mex. (San Miguel County), Colo. (Moffat County). Pollen: Unknown, but visits flowers of *Pectis papposa*.

*Perdita lasiogastra* Timberlake, 1929. N. Y. Ent. Soc., Jour. 37: 115. ♂.

Taxonomy: Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 9, 20, 84-86, figs. 606, 607, 705. ♀, ♂ (key, redescription, geogr. and floral records).

**laticincta** Swenk and Cockerell. N. Dak., Nebr., Kans., Wyo., N. Mex. Pollen: Unknown, but visits flowers of *Amorpha canescens*, *Haplopappus ciliatus*, *Helianthus petiolaris*, *Melilotus*.

*Perdita laticincta* Swenk and Cockerell, 1907. Ent. News 18: 52. ♀, ♂.

Taxonomy: Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 8, 20, 76, figs. 596, 597, 700. ♀, ♂ (key, redescription, geogr. and floral records).



**luteiceps** Cockerell. Colo. (Conejos, Garfield and Routt Counties), Wyo. (Fremont County).

Pollen: Unknown, but visits flowers of *Gutierrezia*.

*Perdita luteiceps* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 74. ♂.

Taxonomy: Timberlake, 1928. N. Y. Ent. Soc., Jour. 37: 112. ♂, ♀. —Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 3, 14, 36-37, figs. 544, 545, 674. ♀, ♂ (key, redescription, geogr. records). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 81 (geogr. and floral records).

**luteola** Cockerell. Nebr., Colo., N. Mex., Ariz. Pollen: Unknown, but visits flowers of

*Chrysothamnus*, *Gutierrezia sarothrae*, *Haplopappus heterophyllus*.

*Perdita luteola* Cockerell, 1894. Ent. News 5: 328. ♂.

Taxonomy: Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 2, 13, 23-24, figs. 526, 527, 664 (key, geogr. and floral records).

**maculigera** var. **bilineata** Timberlake. Ill., Mo., Kans., Nebr., S. Dak.

*Perdita maculipennis* var. *bilineata* Timberlake, 1929. N. Y. Ent. Soc., Jour. 37: 121. ♀, ♂.

Taxonomy: Timberlake, 1952. Ent. Soc. Wash., Proc. 54: 204 (tax. status). —Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 3, 14, 33 (tax. status, tax. characters, key, geogr. records).

—Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 320, figs. 76, 77, table 9 (tax. characters).

**maculigera maculigera** Cockerell. Tex. (Southmost), N. Mex. (Las Cruces). Pollen: Unknown, but visits flowers of *Salix*.

*Perdita maculigera* Cockerell, 1896. Ent. News 7: 255. ♂.

Taxonomy: Timberlake, 1952. Ent. Soc. Wash., Proc. 54: 204 (tax. status). —Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 3, 14, 32-33 (key, redescription, geogr. and floral records).

**maculigera maculipennis** Graenicher. Minn., Wis., Mich., Ill., Iowa, Kans., Tex. (Anderson and Robertson Counties). Parasite: *Euphyto pollinaris* Reinhard. Pollen: Collects pollen from flowers of *Salix nigra* although has been listed as collecting pollen from flowers of *Melilotus alba*, visits other flowers presumably for nectar including *Erigeron philadelphicus*.

*Perdita maculipennis* Graenicher, 1910. Canad. Ent. 42: 102. ♀.

Taxonomy: Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 9, 14, 33-34, figs. 540, 541, 671, 672.

♀, ♂ (key, redescription, geogr. and floral records). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 320-321, figs. 75, 77, table 9 (redescription). —Rozen, 1966. Amer. Mus. Novitates 2259: 19-20 (larva). —Yager and Rozen, 1966. Amer. Mus. Novitates 2265: 12

(pupa).

Biology: Michener and Ordway, 1963. Kans. Ent. Soc., Jour. 36: 34-45, 10 figs. (nest architecture, life history, immature stages, flight behavior, pollen source, parasite).

**maculipes** Cockerell. N. Mex. (Las Cruces). Pollen: Unknown, but visits flowers of

*Haplopappus heterophyllus*.

*Perdita maculipes* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 87. ♂.

Taxonomy: Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 121 (tax. characters). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 65, 81-82 (key, redescription of type).

**media** Timberlake. Calif. (Colorado and Mojave Deserts). Pollen: Unknown, but visits flowers of *Gutierrezia lucida*, *Haplopappus acradenius*, *Solidago confinis*.

*Perdita media* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 73, figs. 592, 593, 698. ♀, ♂.

**melanostoma albocincta** Timberlake. N. Mex., Ariz. Pollen: Unknown, but visits flowers of *Baileya*, *Gutierrezia*, *Haplopappus spinulosus*.

*Perdita albocincta* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 78. ♀.

Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 63, 83-84 (geogr. and floral records).

**melanostoma melanostoma** Swenk and Cockerell. Idaho, Utah, Colo., Nebr., N. Mex., Ariz.

Pollen: Unknown, but visits flowers of *Chrysothamnus*, *Gutierrezia* including *G. sarothrae*.

*Perdita melanostoma* Swenk and Cockerell, 1907. Ent. News 18: 57. ♀.

- Taxonomy: Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 8, 78 (key, redescription, geogr. and floral records). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 63, 65, 82-83, figs. 11, 1241, 1242, 1324. ♂ (key, redescription, geogr. and floral records).
- mesillensis** Timberlake. N. Mex. (Mesilla Park). Pollen: Unknown, but visits flowers of *Gutierrezia lucida*, *Pectis papposa*.
- Perdita mesillensis* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 84, figs. 1243, 1244, 1325. ♂.
- Taxonomy: Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 28 (tax. characters, synonymy).
- microsticta** Timberlake. Kans. (Scott County).
- Perdita microsticta* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 89. ♀.
- mimula** Timberlake. Calif. (Colorado Desert). Pollen: Unknown, but visits flowers of *Haplopappus acradenioides*.
- Perdita mimula* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 53. ♀.
- Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 63 (key).
- nuda** Cockerell. N. Mex., Ariz., Colo., Utah, Idaho (Franklin County). Parasite: *Megaselia*, *Sphecodes* sp. near *fragariae* Ckll. Pollen: Apparently collects pollen only from vernal and autumnal flowering Compositae including *Chrysothamnus*, *Erigeron*, *Grindelia* including *G. squarrosa*.
- Perdita nuda* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 93. ♀.
- Taxonomy: Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 12, 119. ♀ (redescription, key). —Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 104-105, figs. 839, 840, 898. ♂, ♀ (geogr. and floral records). —Torchio, 1975. Kans. Ent. Soc., Jour. 48: 266-275, 277-278, figs. 1-18, 26, 27 (immature stages).
- Biology: Torchio, 1975. Kans. Ent. Soc., Jour. 48: 257-279, 27 figs. (nest architecture, life history, nest associates).
- numerata hesperia** Timberlake. South. Calif. (Colorado Desert); Mexico (Baja California). Pollen: Unknown, but visits flowers of *Geraea canescens*, *Larrea tridentata*, *Melilotus*, *Prosopis*, *Tamarix*.
- Perdita numerata hesperia* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 62. ♀, ♂.
- numerata numerata** Cockerell. Tex., N. Mex., Ariz. (Phoenix), ?Calif. (Needles). Pollen: Unknown, but visits flowers of *Actinea*, *Prosopis*, *Salix*.
- Perdita numerata* Cockerell, 1895. Amer. Ent. Soc., Trans. 22: 296. ♀.
- Taxonomy: Cockerell, 1916. Ann. and Mag. Nat. Hist. (8) 17: 281. ♂. —Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 6, 15, 60-62, figs. 572, 573, 688 (key, redescription, tax. status, geogr. and floral records).
- occidua** Timberlake. Ariz. (Oak Creek Canyon).
- Perdita occidua* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 120. ♀.
- occlusa** Timberlake. Ariz. (Walnut Canyon near Flagstaff).
- Perdita occlusa* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 85, figs. 1245, 1246, 1326. ♂.
- octomaculata octomaculata** (Say). N. B. south to Ga., west to Minn., Ill. and Miss. Pollen: Unknown, but visits flowers of *Aster ericoides*, *A. puniceus*, *Bidens*, *Boltonia*, *Eupatorium*, *Euthamia*, *Lycopus*, *Monarda*, *Solidago*.
- Panurgus 8-maculatus* Say, 1824. In Keating, Narr. Long's 2nd Exped., v. 2, p. 350. ♂, ♀.
- Perdita octomaculata* Dalla Torre, 1896. Cat. Hym., v. 10, p. 173. Emend.
- Taxonomy: Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 12, 22, 111-113, figs. 642, 643, 723 (key, redescription, geogr. and floral records). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 321-322, figs. 76-79, table 9 (redescription, geogr. range, floral records).
- octomaculata terminata** Cockerell. N. Dak., Nebr., Kans., Iowa, Ill., Ark., Miss. Pollen: Unknown, but visits flowers of *Aster azureus*, *A. multiflorus*, *A. saliciflorus*, *Solidago canadensis*, *S. rigida*.
- Perdita octomaculata terminata* Cockerell, 1922. Amer. Mus. Novitates 33: 8. ♂, ♀.
- Taxonomy: Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 12, 22, 113-114 (key, tax. characters, geogr. and floral records). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 322 (tax. characters, geogr. range).

- ordinata** Timberlake. Ariz. (Cochise and Navajo Counties), N. Mex. (Hidalgo and Socorro Counties), Utah (Cache and Washington Counties). Pollen: Unknown, but visits flowers of *Baileya pleniradiata*, *Dithyrea* including *D. wislizenii*, *Heterotheca subaxillaris*, *Pectis papposa*.  
*Perdita ordinata* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 105, figs. 841, 842, 899. ♂.
- Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 67, 86, fig. 12 (key, geogr. and floral records). —Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 28-29. ♂, ♀ (geogr. and floral records).
- paroselae** Timberlake. South. Calif. (Colorado Desert). Pollen: Possibly an oligolege of *Dalea*, visits flowers of *Dalea californica*, *D. emoryi*.  
*Perdita paroselae* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 65, figs. 578, 579, 691. ♀, ♂.
- pectidis** Cockerell. N. Mex., Ariz. (Salome). Pollen: Unknown, but visits flowers of *Kallstroemia*, *Pectis papposa*, *Sesuvium verrucosum*, *Weddellia*.  
*Perdita pectidis* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 83. ♀, ♂.
- Taxonomy: Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 9, 19, 91-92, figs. 614, 615, 709. ♀, ♂ (key, tax. characters, geogr. and floral records).
- percincta** Timberlake. Utah (Skull Rock Pass, 6,100ft.), Ariz. (Coconino County). Pollen: Unknown, but visits flowers of *Aster*, *Gutierrezia microcephala*, *Wislizenia refracta*.  
*Perdita percincta* Timberlake, 1968. Univ. Pubs. Ent. 49: 86. ♀.
- Taxonomy: Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 30-31, figs. 1379, 1380, 1408. ♂, ♀ (key, redescription, geogr. and floral records).
- perixantha** Timberlake. Ariz. (Navajo County).  
*Perdita perixantha* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 23, figs. 524, 525, 663. ♂.
- perpallida citrinella** Graenicher. Wis., Minn., N. Dak., Nebr., Alta. Pollen: Unknown, but visits flowers of *Petalostemon purpureum*, *P. villosum*.  
*Perdita citrinella* Graenicher, 1910. Canad. Ent. 42: 103. ♀.
- Taxonomy: Crawford, 1912. Canad. Ent. 44: 359. ♂, ♀. —Timberlake, 1952. Ent. Soc. Wash., Proc. 54: 204 (tax. status). —Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 3, 14, 26-27 (key, tax. characters, geogr. and floral records).
- perpallida perpallida** Cockerell. Man., Minn., N. Dak., Nebr., Kans., N. Mex. Pollen: Apparently an oligolege of vernal and autumnal flowering Compositae, visits flowers of *Amorpha canescens*, *Helenium autumnale*, *Petalostemon candidum*, *P. oligophyllum*, *P. villosum*, *Solidago occidentalis*.  
*Perdita perpallida* Cockerell, 1901. Entomologist 34: 190. ♀, ♂.
- Taxonomy: Swenk and Cockerell, 1907. Ent. News 18: 57. —Stevens, 1919. Canad. Ent. 51: 207. ♀, ♂ (tax. characters, floral records). —Timberlake, 1952. Ent. Soc. Wash., Proc. 54: 204 (tax. status). —Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 2, 13, 25-26, figs. 532, 533, 667. ♀, ♂ (key, redescription, geogr. and floral records). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 322 (tax. status).
- phymatae** Cockerell. N. Mex., Ariz., Utah. Pollen: Unknown, but visits flowers of *Bahia absinthifolia*, *Baileya pleniradiata*, *Gutierrezia lucida*, *G. microcephala*, *Haplopappus heterophyllus*, *Pectis papposa*. Predator: *Phymata* sp.  
*Perdita phymatae* Cockerell, 1895. Acad. Nat. Sci. Phila., Proc. 47: 12. ♀.  
*Perdita nitidella* Cockerell, 1895. Acad. Nat. Sci. Phila., Proc. 47: 16. ♂.
- Taxonomy: Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 9, 92-93 (key, redescription, geographic, floral and predator records). —Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 70-71, figs. 586, 587, 695. ♂ (as *nitidella*). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 64, 85. ♀ (key, redescription, as *nitidella*). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 65 (key). —Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 31 (synonymy, geogr. range, tax. characters).
- picturata** Timberlake. Tex. (Victoria and Aransas Counties).  
*Perdita picturata* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 50, figs. 560, 561, 682. ♀, ♂.

- plucheae** Timberlake. Calif. (Colorado Desert), Ariz.; Mexico (Baja California). Pollen: Unknown, but visits flowers of *Pluchea sericea*, *Tamarix gallica*.  
*Perdita plucheae* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 69, figs. 584, 585, 694. ♀, ♂.
- polygonellae** Timberlake. N. C. (Coastal Plain). Pollen: Unknown, but visits flowers of *Polygonella polygama*.  
*Perdita polygonellae* Timberlake, 1954. Ent. News 65: 12. ♀, ♂.
- Taxonomy: Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 4, 16, 40, figs. 552, 553, 678 (key, tax. characters). — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 323, figs. 76-79, table 9 (redescription).
- prionopsidis** Timberlake. Kans. (Reno and Montgomery Counties). Pollen: Unknown, but visits flowers of *Boltonia asteriodes*, *Haplopappus ciliatus*, *Helianthus petiolaris*, *Heterotheca subaxillaris*.  
*Perdita prionopsidis* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 104, figs. 632, 633, 718. ♀, ♂.
- rectangulata** Cockerell. Colo., Idaho, Ariz. (Holbrook). Pollen: Unknown, but visits flowers of *Chrysothamnus*, *Gutierrezia sarothrae*, *Solidago*.  
*Perdita rectangulata* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 72. ♀ (♂ misdet.).
- Taxonomy: Stevens, 1919. Canad. Ent. 51: 207. ♂, ♀ (as *martini*). — Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 3, 9, 16, 82-83, figs. 602, 603, 703. ♀, ♂ (key, redescription, geogr. and floral records, in part *martini*). — Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 64, 65, 87-88 (key, tax. characters and tax. status).
- reperta** Timberlake. N. Mex. (Quemado), Ariz. (Navajo County), Colo. (Alamosa County). Pollen: Unknown, but visits flowers of *Chrysothamnus* including *C. viscidiflorus*.  
 Predator: *Philanthus* sp.  
*Perdita reperta* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 88, figs. 13, 1247, 1248, 1327. ♀, ♂.
- retusa** Timberlake. Ariz. (Mohave and Yuma Counties), Calif. (Colorado and Mojave Deserts). Pollen: Unknown, but visits flowers of *Chrysothamnus paniculatus*, *Haplopappus*.  
*Perdita retusa* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 86, figs. 608, 609, 706. ♀, ♂.
- rhodura** Cockerell. Ariz., N. Mex., Nebr. (Sioux County). Pollen: Unknown, but visits flowers of *Gutierrezia sarothrae*, *Haplopappus*, *Zinnia grandiflora*.  
*Perdita rhodura* Cockerell, 1897. Ann. and Mag. Nat. Hist. (6) 20: 511. ♀, ♂.
- Taxonomy: Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 6, 15, 52-53, figs. 564, 565, 684. ♀, ♂ (key, redescription, geogr. and floral records). — Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 63, 66 (key).
- scitula antiochensis** Timberlake. Calif. (Antioch, Oakley). Pollen: Unknown, but visits flowers of *Eriogonum*, *Gutierrezia californica*, *Heterotheca grandiflora*, *Lessingia glandulifera*.  
*Perdita scitula antiochensis* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 80, figs. 598, 599, 701. ♀, ♂.
- scitula scitula** Timberlake. Calif. (Inyo County). Pollen: Unknown, but visits flowers of *Chrysothamnus nauseosus* var. *gnaphalodes*.  
*Perdita scitula scitula* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 79. ♀, ♂.
- sedulosa** Timberlake. N. Mex. (Socorro County). Pollen: Unknown, but visits flowers of *Baileya pleniradiata*.  
*Perdita sedulosa* Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 31. ♀.
- sejuncta** Timberlake. N. Mex. (Socorro County), Utah (Wah Wah Mts.); Mexico (Chihuahua). Pollen: Unknown, but visits flowers of *Gutierrezia microcephala*.  
*Perdita sejuncta* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 90. ♀.
- Taxonomy: Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 32 (geogr. record).
- senecionis** Cockerell. N. Mex. (Las Cruces). Pollen: Unknown, but visits flowers of *Senecio douglasii*.  
*Perdita senecionis* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 94. ♀.
- Taxonomy: Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 11, 100-101. ♀ (redescription, key).

*separata* Timberlake. Tex. (Zapata County).

*Perdita separata* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 106. ♀.

*snowii* Cockerell. Colo. (Boulder, Costilla and Moffat Counties), Ariz. (Holbrook). Pollen: Unknown, but visits flowers of *Aster*, *Grindelia*, *Gutierrezia*.

*Perdita snowii* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 73. ♀.

Taxonomy: Cockerell, 1910. Psyche 17: 244. ♂. —Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 9, 20, 83-84, figs. 604, 605, 704. ♀, ♂ (key, redescription, geogr. and floral records).

—Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 64, 91 (tax. characters, key).

*solidaginis* Cockerell. Colo. (White Rocks, near Boulder). Pollen: Unknown, but visits flowers of *Solidago*.

*Perdita solidaginis* Cockerell, 1922. Amer. Mus. Novitates 33: 12. ♂.

Taxonomy: Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 316-317 (tax. characters).

—Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 66, 91-92. ♂ (key, redescription of type specimen).

*stepheni* Timberlake. Tex. (Dimmit County). Pollen: Unknown, but visits flowers of *Monarda punctata*.

*Perdita stepheni* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 29, figs. 536, 537, 669. ♂.

*submedia* Timberlake. Ariz. (Apache County). Pollen: Unknown, but visits flowers of *Chrysothamnus*.

*Perdita submedia* Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 32. ♀.

*swenki* Crawford. N. Y. (Long Island), Mich., Ill., Wis., Minn., N. Dak., Nebr., Alta. Pollen:

Unknown, but visits flowers of *Chrysopsis*, *Grindelia*, *Helianthus maximilianii*, *Liatris*, *Solidago juncea*, *S. rigida*.

*Perdita swenki* Crawford, 1915. Insector Inscitiae Menstruus 3: 109. ♂, ♀.

Taxonomy: Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 10, 19, 103-104, figs. 630, 631, 717. ♀, ♂ (key, redescription, geogr. and floral records). —Mitchell, 1960. N. C. Agr. Expt. Sta.

Tech. Bul. 141: 324, figs. 76-78, table 9 (redescription). —Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 33 (geogr. records).

*tacita* Timberlake. Idaho (Owyhee County).

*Perdita tacita* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 93. ♀.

*translineata* Timberlake. Tex. (Brazos and Van Zandt Counties), N. Mex. (Socorro County).

Pollen: Unknown, but visits flowers of *Baileya pleniradiata*, *Eriogonum multiflorum*, *Haplopappus divaricatus*, *Heterotheca subaxillaris*.

*Perdita translineata* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 93, figs. 618, 619, 711. ♂.

Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 65, 67, 94. ♀, ♂ (key, redescription, geogr. and floral records).

*tridentata* Stevens. N. Dak., Nebr., Kans. Pollen: Unknown, but visits flowers of *Haplopappus*, *Helianthus petiolaris*.

*Perdita tridentata* Stevens, 1919. Canad. Ent. 51: 206. ♂.

Taxonomy: Stevens, 1921. Canad. Ent. 53: 66. ♀. —Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 12, 21, 118-119, figs. 650, 651, 727. ♀, ♂ (key, redescription, geogr. and floral records).

*trifida* Timberlake. Calif. (Mojave Desert). Pollen: Unknown, but visits flowers of *Baccharis emoryi*, *Haplopappus acradenius*.

*Perdita trifida* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 37, figs. 546, 547, 675. ♂.

*trimaculata* Timberlake. South. Calif. (Colorado and Mojave Deserts), Ariz. (Mohave County).

Pollen: Unknown, but visits flowers of *Chrysothamnus nauseosus*, *C. paniculatus*, *Gutierrezia lucida*.

*Perdita trimaculata* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 62, figs. 574, 575, 689. ♀, ♂.

*truncatella* Timberlake. Ariz. (Snowflake).

*Perdita truncatella* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 94, figs. 1251, 1252, 1329. ♂.

- variegata pura** Timberlake. Tex., Kans. (Garden City). Pollen: Unknown, but visits flowers of *Monarda punctata* var. *occidentalis*.  
*Perdita variegata pura* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 31. ♀, ♂.
- variegata variegata** Timberlake. Kans. Pollen: Unknown, but so far has been collected exclusively at the flowers of *Monarda* including *M. punctata* var. *occidentalis*.  
*Perdita variegata variegata* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 30, figs. 538, 539, 670. ♀, ♂.
- versuta** Timberlake. Tex. (Kingsville).  
*Perdita versuta* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 105, figs. 843, 844, 900. ♂.
- xanthochroa** Timberlake. Colo. (Moffat County), Utah (Juab and Uinta Counties), Idaho (Owyhee County). Pollen: Unknown, but visits flowers of *Sphaeralcea ambigua*, *Stanleya pinnata*.  
*Perdita xanthochroa* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 24, figs. 530, 531, 666. ♀, ♂.
- xanthodes** Timberlake. Calif. (Mohave Desert). Pollen: Unknown, but visits flowers of *Gutierrezia lucida*, *Haplopappus cooperi*.  
*Perdita xanthodes* Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 24, figs. 528, 529, 665. ♀, ♂.
- Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 63 (key). —Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 33 (geogr. and floral records).
- xanthops** Timberlake. Wyo. (Carbon County).  
*Perdita xanthops* Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 33, figs. 1381, 1382, 1409. ♀, ♂.

## SPECIES GROUP VENTRALIS

- Taxonomy: Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 1, 2-14 (key, tax. characters, key to included spp.). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 95-97 (suppl. key to included spp.).
- acaciae** Timberlake. South. Calif. (Colorado Desert). Pollen: Unknown, but visits flowers of *Acacia greggii*, *Agave consociata*, *A. deserti*.  
*Perdita acaciae* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 61, figs. 799, 800, 878. ♀, ♂.
- albata** Timberlake. Ariz. (Navajo County). Pollen: Unknown, but visits flowers of *Mentzelia pumila*.  
*Perdita albata* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 97. ♀.
- amplipennis** Timberlake. Calif. mts. (Inyo and Mono Counties). Pollen: Unknown, but visits flowers of *Eriogonum fasciculatum*, *Stanleya pinnata*, and presumably *Dalea*.  
*Perdita amplipennis* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 30, figs. 751, 752, 854. ♀, ♂.
- austini** Cockerell. N. Mex. Pollen: Unknown, but visits flowers of *Baileya pleniradiata*, *Gutierrezia microcephala*, *G. sarothrae*, *Haplopappus*.  
*Perdita austini* Cockerell, 1895. Acad. Nat. Sci. Phila., Proc. 47: 13. ♂.  
*Perdita aeneifrons* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 91. ♀.
- Taxonomy: Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 10, 40-41, figs. 769, 770, 863. ♂ (redescription). —Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 125. ♂, ♀ (synonymy). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 96, 97, 98-99 ♀, ♂ (key, redescription, geogr. and floral records).
- bicuspidae** Timberlake. South. Calif. (Colorado Desert). Pollen: Collects pollen from the flowers of *Mentzelia involucreta*, but also visits flowers of *Hyptis emoryi* presumably for nectar.  
*Perdita bicuspidae* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 20, figs. 741, 742, 849. ♂, ♀.
- brevihirta** Timberlake. Ariz. (Maricopa County), Wyo. (Fremont County). Pollen: Unknown, but visits flowers of *Chrysothamnus nauseosus*, *Pectis papposa*.  
*Perdita brevihirta* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 41, figs. 771, 772, 864. ♀, ♂.

- Taxonomy: Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 34 (geogr. and floral records).
- claypolei australior** Timberlake. Calif. (San Diego and Los Angeles Counties). Pollen: Unknown, but visits flowers of *Adenostoma fasciculatum*, *Eriogonum fasciculatum*, *Hemizonia fasciculata*, *Heteromeles arbutifolia*, *Opuntia*.  
*Perdita claypolei australior* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 68. ♀, ♂.
- claypolei claypolei** Cockerell. South. Calif. (cismontane). Pollen: Collects pollen from the flowers of *Eriogonum* including *E. elongatum*, *E. fasciculatum*, *E. gracile*, *E. wrightii* var. *subscaposum*, *E. umbellatum*, but visits these and other flowers for nectar including *Eriastrum virgatum*.  
*Perdita claypolei* Cockerell, 1901. Canad. Ent. 33: 281. ♀.
- Taxonomy: Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 6, 13, 66-68, figs. 805, 806, 881. ♀, ♂ (key, redescription, geogr. and floral records).
- claypolei limatula** Timberlake. Calif. (Kern County) to Oreg., and Nev. (Douglas County). Pollen: Collects pollen from the flowers of *Eriogonum* including *E. elatum*, *E. fasciculatum*, *E. gracile*, *E. heermannii*, *E. inflatum*, *E. latifolium*, *E. nudum*, *E. vimineum*, *E. virgatum*, *E. wrightii* var. *subscaposum*, but visits these and other flowers for nectar including *Achillea millefolium*, *Brickellia*, *Cirsium*, *Solidago*.  
*Perdita claypolei limatula* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 68. ♀, ♂.
- clypeata clypeata** Timberlake. South. Calif. (Colorado Desert). Pollen: Unknown, but visits flowers of *Eriogonum inflatum*.  
*Perdita clypeata clypeata* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 79, figs. 817, 818, 887. ♀, ♂.
- clypeata immaculata** Timberlake. Ariz. (near Mesa), south. Calif. (Desert Center and Hayfield). Pollen: Unknown, but visits flowers of *Eriogonum inflatum*.  
*Perdita clypeata immaculata* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 80. ♀, ♂.
- colei** Timberlake. Calif. (San Bernardino Mts. and vicinity). Pollen: Unknown, but visits flowers of *Chorizanthe staticoides*, *Chrysothamnus nauseosus*, *Gutierrezia lucida*, *Lepidospartum squamatum*, *Solidago confinis*.  
*Perdita colei* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 48, figs. 783, 784, 870. ♀, ♂.
- crandalli** Timberlake. Ariz. (Pima and Pinal Counties). Pollen: Unknown, but visits flowers of *Petalonyx thurberi*.  
*Perdita crandalli* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 38. ♀.
- dasyliirii** Cockerell. Western Tex. to Ariz. Pollen: Unknown, but visits flowers of *Acacia*, *Agave palmeri*, *Amorpha fruticosa*, *Asclepias galioides*, *Ceanothus*, *Dasyliirion wheeleri*, *Euphorbia albomarginata*, *Mertensia franciscana*, *Nolina microcarpa*, *Rudbeckia laciniata*, *Salix taxifolia*, *Sapindus saponaria*.  
*Perdita dasyliirii* Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 19: 539. "♀" = ♂ (♂ misdet.).  
*Perdita nolinae* Cockerell, 1922. Amer. Mus. Novitates 33: 11. ♀.
- Taxonomy: Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 5, 12, 55-57, figs. 793, 794, 875. ♀, ♂ (key, redescription, geogr. and floral records).
- dimidiata** Timberlake. Ariz. (Pinal County); Mexico (Baja California). Pollen: Unknown, but visits flowers of *Sesuvium verrucosum*.  
*Perdita dimidiata* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 39, figs. 767, 768, 862. ♂.
- distans** Timberlake. South. Calif. (Colorado and Mojave Deserts). Pollen: Unknown, but visits flowers of *Eriogonum* including *E. reniforme*, *E. thomasi*.  
*Perdita distans* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 73, figs. 811, 812, 884. ♀, ♂.
- erythropyga** Timberlake. South. Calif. (Colorado Desert). Pollen: Collects pollen of *Dalea* including *D. californica*, *D. emoryi*, but also visits other flowers for nectar including *Cryptantha angustifolia*, *Isomeris arborea*, *Larrea tridentata*.  
*Perdita erythropyga* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 42, figs. 773, 774, 865. ♀, ♂.
- exilis** Timberlake. South. Calif. (Colorado and Mojave Deserts). Pollen: Collects pollen from *Petalonyx thurberi*.  
*Perdita exilis* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 36, figs. 763, 764, 860. ♂, ♀.

- fulvicauda** Timberlake. South. Calif. (Colorado Desert); Mexico (Baja California). Pollen: Unknown, but visits flowers of *Baileya pleniradiata*, *Coldenia plicata*, *Dalea mollis*, *Larrea tridentata*, *Melilotus*, *Nama hispidum*, *Phacelia distans*, *Prosopis juliflora*, *Verbena*.  
*Perdita fulvicauda* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 43, figs. 775, 776, 866. ♀, ♂.
- gentilis** Timberlake. Nev. (Churchill and Washoe Counties), Ariz. (Vermillion Cliffs). Pollen: Unknown, but visits flowers of *Eriogonum*.  
*Perdita gentilis* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 78. ♀.
- Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 96, 97, 109-110. ♀, ♂ (key, geogr. and floral record).
- glabella** Timberlake. Ariz. (Continental).  
*Perdita glabella* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 104. ♀.
- glabrescens** Timberlake. Calif. (Inyo County).  
*Perdita glabrescens* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 38, figs. 765, 766, 861. ♀, ♂.
- grandiceps** Cockerell. N. Mex. (Alamogordo, La Cueva and Las Cruces). Pollen: Unknown, but visits flowers of *Fallugia paradoxa*, *Solidago*.  
*Perdita grandiceps* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 96. ♂.
- Taxonomy: Cockerell, 1899. Canad. Ent. 31: 256. ♀. —Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 3, 10, 32-33, figs. 757, 758, 857. ♀, ♂ (key, redescription, geogr. and floral records).
- holoxantha** Timberlake. Utah (Grand and Washington Counties), Ariz. (Holbrook). Pollen: Unknown, but visits flowers of *Mentzelia pumila*, *Poleomintha incana*.  
*Perdita holoxantha* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 17, figs. 737, 738, 847. ♂.
- Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 95, 96, 100. ♀, ♂ (key, geogr. and floral records).
- inornata** Timberlake. Calif. (Clark Mt. and Panamint Mts.), Nev. (Charleston Mts.), Ariz. (Grand Canyon, south rim). Pollen: Unknown, but visits flowers of *Agave deserti*, *Cowania stansburiana*, *Eriodictyon*.  
*Perdita inornata* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 49, figs. 787, 788, 872. ♀, ♂.
- jucunda** Timberlake. Calif., Nev. (Churchill County), Ariz. (Painted Desert). Pollen: Collects pollen from the flowers of *Eriogonum*, including *E. aureum*, *E. fasciculatum*, *E. gracile*, *E. inflatum*, *E. molestum* var. *davidsonii*, *E. nudum*, but also visits other flowers for nectar including *Chorizanthe staticoides*, *Gutierrezia lucida*, *Lepidospartum squamatum*.  
*Perdita jucunda* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 64, figs. 803, 804, 880. ♀, ♂.
- kanabensis** Timberlake. Utah (Kanab), Ariz. (Coconino County). Pollen: Unknown, but visits flowers of *Cleomella*, *Eriogonum corymbosum*.  
*Perdita kanabensis* Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 34, figs. 1383, 1384, 1410.
- labrata** Timberlake. South. Calif. (Colorado and Mojave Deserts). Pollen: Evidently collects pollen from the flowers of *Eriogonum* including *E. fasciculatum* var. *polifolium*, but also visits other flowers presumably for nectar including *Larrea tridentata*.  
*Perdita labrata* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 81, figs. 821, 822, 889, 901. ♀, ♂.
- lateralis daeae** Timberlake. Calif. (Inyo and Panamint Mts.). Pollen: Apparently an oligolege of *Larrea tridentata*, but visits other flowers presumably for nectar including *Chaenactis*, *D. fremontii*, *D. f.* var. *johnsonii*, *Eriogonum fasciculatum*, *E. inflatum*.  
*Perdita lateralis daeae* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 29. ♀, ♂.
- lateralis lateralis** Timberlake. Calif. (Colorado Desert), Ariz. (Maricopa, Pinal and Yuma Counties). Pollen: Apparently an oligolege of *Larrea tridentata*, but also visits other flowers presumably for nectar including *Chaenactis*, *Dalea californica*, *Eriogonum fasciculatum*, *Hyptis emoryi*, *Prosopis juliflora*.  
*Perdita lateralis lateralis* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 27, figs. 749, 750, 853. ♀, ♂.
- Biology: Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 25 (floral relationships).



**lucens** Timberlake. South. Calif. (Mojave Desert), Nev. (Churchill County). Pollen: Possibly an oligolege of *Eriogonum*, visits flowers of *E. fasciculatum*, *E. inflatum*, *E. mohaveense*, *E. nodosum*.

*Perdita lucens* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 71, figs. 809, 810, 883. ♀, ♂.

**lunulata** Timberlake. Ariz. (Apache and Navajo Counties). Pollen: Collects pollen from the flowers of *Mentzelia pumila*, but also visits the flowers of *Eriogonum aureum* presumably for nectar.

*Perdita lunulata* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 22. ♀.

Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 96, 101. ♀, ♂ (tax. status, key, geogr. and floral relationships).

**melanops** Timberlake. South. Calif. (Santa Rosa Mts.). Pollen: Unknown, but visits flowers of *Physalis crassifolia*.

*Perdita melanops* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 105. ♀.

**melanura** Timberlake. Ariz. (Grand Canyon).

*Perdita melanura* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 52. ♀.

**mentzeliae** Cockerell. Colo. (Antonita and Trinidad), N. Mex., Ariz., (Cochise, Greenlee and Navajo Counties). Pollen: Collects pollen from the flowers of *Mentzelia pumila*.

*Perdita mentzeliae* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 60. ♂, ♀.

*Perdita pallidior* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 61. ♂, ♀.

*Perdita pulchrior* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 62. ♂.

Taxonomy: Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 3, 10, 24-26, figs. 745, 746, 851. ♀, ♂ (key, redescription, synonymy, geogr. and floral records). — Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 101 (geogr. and floral records).

Biology: Linsley and Hurd, 1959. Ent. News 70: 64, 65, 67 (floral relationships).

**mentzeliarum** Cockerell. West. Tex. to Ariz.; Mexico (Baja California and Chihuahua). Pollen: Apparently an oligolege of *Mentzelia pumila*, but visits flowers of *Bahia absinthifolia* for nectar.

*Perdita mentzeliarum* Cockerell, 1897. N. Mex. Agr. Expt. Sta., Bul. 24: 43. ♀, ♂.

*Perdita mentzeliarum* var. *lauta* Cockerell, 1905. Entomologist 38: 145. ♀, ♂.

Taxonomy: Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 3, 9, 23-24, figs. 743, 744, 850. ♀, ♂ (key, redescription, synonymy, geogr. and floral records). — Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 101 (geogr. and floral records).

**michelbacheri** Timberlake. Ariz. (Maricopa County); Mexico (Baja California). Pollen: Unknown, but visits flowers of *Acacia*, *Carnegiea gigantea*.

*Perdita michelbacheri* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 60, figs. 797, 798, 877. ♀, ♂.

**nasuta galactioptera** Timberlake. Calif. (Inyo and Panamint Mts.). Pollen: Apparently an oligolege of *Eriogonum*, visits flowers of *E. inflatum*.

*Perdita nasuta galactioptera* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 76. ♀, ♂.

**nasuta nasuta** Timberlake. South. Calif. (Colorado and Mojave Deserts), Nev. (Clark County), Ariz. (Mohave, Pinal and Yuma Counties). Pollen: Apparently an oligolege of *Eriogonum*, visits flowers of *E. trichopes*.

*Perdita nasuta nasuta* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 74, figs. 813, 814, 885. ♀, ♂.

**nasuta obscurens** Timberlake. Ariz., N. Mex. (Las Cruces). Pollen: Apparently an oligolege of *Eriogonum*, visits flowers of *E. thomasi*, *E. trichopes*.

*Perdita nasuta obscurens* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 76. ♀, ♂.

**nigridia** Timberlake. Calif. (Colorado and Mojave Deserts), Ariz. (Mohave County); Mexico (Baja California). Pollen: Apparently collects pollen only from the flowers of *Mentzelia* including *M. albicaulis*, *M. involucreta*, *M. pumila*, *M. tricusps*, but visits these and apparently other flowers for nectar including *Eucelia fariuosa*, *Eriogonum fasciculatum*, *Euclide urens*.

*Perdita nigridia* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 18, figs. 777, 778, 867. ♂, ♀.

Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 101 (geogr. and floral record).

**nodosicornia** Timberlake. Calif. (Coalinga).

*Perdita nodosicornia* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 110, fig. 1360. ♂.

**pectoralis** Timberlake. Ariz. (Vermillion Cliffs). Pollen: Unknown, but visits flowers of *Eriogonum*.

*Perdita pectoralis* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 111, figs. 1265, 1266, 1336. ♂.

**perplexa** Timberlake. N. Mex. (Catron County). Pollen: Unknown, but visits flowers of *Mentzelia*.

*Perdita perplexa* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 19, figs. 739, 740, 848. ♀ (♂ misdet.).

Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 101 (tax. status).

**polytropica obsoleta** Timberlake. Ariz. (Maricopa, Pima and Pinal Counties). Pollen: Polylectic, visits flowers of *Acacia*, *Carnegiea gigantea*, *Cercidium*, *Echinocactus*.

*Perdita polytropica obsoleta* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 59. ♀, ♂.

**polytropica polytropica** Timberlake. South. Calif. (Colorado and Mojave Deserts). Pollen:

Polylectic, visits a wide variety of flowers including *Acacia greggii*, *Agave deserti*, *Asclepias subulata*, *Carnegiea gigantea*, *Croton californicus*, *Dalea spinosa*, *Eucelia farinosa*, *Echinocactus*, *Eriogonum inflatum*, *Ferrocactus acanthodes*, *Hyptis emoryi*, *Larrea tridentata*, *Olneya tesota*, *Opuntia*, *Prosopis juliflora*.

*Perdita polytropica polytropica* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 57, figs. 795, 796, 876. ♀, ♂.

**punctifera** Cockerell. Ariz., south. Calif. (Blythe); Mexico (Baja California). Pollen: Collects pollen from the flowers of *Mentzelia pumila*, but also visits the flowers of *Gossypium thurberi* presumably for nectar.

*Perdita punctifera* Cockerell, 1914. Ent. Soc. Wash., Proc. 16: 32. ♀.

Taxonomy: Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 3, 9, 26-27, figs. 747, 748, 852. ♀, ♂ (key, redescription, geogr. and floral records).

**rehni praeclara** Timberlake. Ariz. (Southwestern Research Station).

*Perdita rehni praeclara* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 106, fig. 14. ♀.

**rehni rehni** Cockerell. N. Mex., western Tex.; Mexico (Chihuahua). Pollen: Unknown, but visits flowers of *Dasyliirion wheeleri*, *Nolina*.

*Perdita Rehni* Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 20: 131. ♀ (= male).

Taxonomy: Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 8, 12, 50-52, figs. 789, 790, 873. ♀, ♂ (key, redescription, geogr. and floral records).

**rhois reducta** Cockerell. Calif. (South Coast Ranges). Pollen: Apparently polylectic, visits a wide variety of flowers including *Adenostoma fasciculatum*, *Eriodictyon parryi*, *Eriogonum fasciculatum*, *Heteromeles arbutifolia*, *Rhus laurina*.

*Perdita rhois* mut. *reducta* Cockerell, 1901. Canad. Ent. 33: 283. ♀.

Taxonomy: Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 6, 54-55. ♀, ♂ (key, redescription, geogr. and floral records).

**rhois rhois** Cockerell. South. Calif. (chiefly cismontane); Mexico (Baja California). Pollen:

Polylectic, visits a wide variety of flowers for pollen and nectar including *Acacia greggii*, *Adenostoma fasciculatum*, *A. sparsifolium*, *Agave deserti*, *Alyssum maritimum*, *Baccharis emoryi*, *B. viminea*, *Chrysanthemum*, *Eriogonum fasciculatum*, *E. f. var. polifolium*, *E. gracile*, *Euphorbia albomarginata*, *Gutierrezia californica*, *Haplopappus linearifolius*, *Heliotropium oculatum*, *Heteromeles arbutifolia*, *Lotus scoparius*, *Mentha*, *Nolina parryi*, *Polygonum lapanthifolium*, *Prunus ilicifolia*, *Rhamnus californicus*, *Rhus laurina*, *Rhus ovata*, *Schinus molle*.

*Perdita rhois* Cockerell, 1901. Canad. Ent. 33: 282. ♀.

*Perdita hypozantha* Cockerell, 1914. Ann. and Mag. Nat. Hist. (8) 13: 424. ♂.

Taxonomy: Timberlake, 1951. In Muesebeck, Krombein and Townes, U. S. Dept. Agr., Agr. Monog. 2: 1094 (synonymy). — Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 6, 12, 53-54, figs. 791, 792, 874. ♀, ♂ (key, redescription, geogr. and floral records).

**semicrocea** Cockerell. N. Mex. (Dona Ana, Otero and San Miguel Counties), Ariz. (Willcox).

Pollen: Unknown, but visits flowers of *Aster*, *Bahia absinthifolia*, *Gutierrezia sarothrae*, *Haplopappus*, *Solidago*.

*Perdita semicrocea* Cockerell, 1895. Acad. Nat. Sci. Phila., Proc. 47: 13. ♀.

Taxonomy: Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 4, 9, 35-36, figs. 761, 762, 859. ♀, ♂ (key, redescription, geogr. and floral records). — Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 96, 101 (key, geogr. and floral record).

**semilutea** Timberlake. Calif. (Box Canyon in Riverside County). Pollen: Unknown, but visits flowers of *Eriogonum thomasi*.

*Perdita semilutea* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 81, figs. 819, 820, 888. ♂.

**snellingi** Timberlake. South. Calif. (Kern and Inyo Counties). Pollen: Presumably an oligolege of vernal and autumnal flowering Compositae, visits flowers of *Chrysothamnus nauseosus consimilis*, *Cleome*, *Eriogonum heermannii*, *Euphorbia albomarginata*, *Gutierrezia lucida*, *G. microcephala*, *Rosa californica*, *Solidago spectabilis*.

*Perdita snellingi* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 46, figs. 781, 782, 869. ♀, ♂.

Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 106-107 (tax. characters, geogr. and floral records).

**sodalis** Timberlake. South. Calif. (Santa Rosa Mts.). Pollen: Unknown, but visits flowers of *Hyptis emoryi*.

*Perdita sodalis* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 101, figs. 1255, 1256, 1331. ♂.

**stabilis** Timberlake. Ariz. (Douglas).

*Perdita stabilis* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 102, figs. 1257, 1258, 1332. ♂.

**subfasciata** Cockerell. N. Mex. Ariz., Utah (Juab County), Nev. (White Pine County), Calif. (Inyo County Mts.). Pollen: Apparently an oligolege of vernal and autumnal flowering Compositae, visits flowers of *Chrysothamnus nauseosus*, *C. viscidiflorus*, *Gutierrezia lucida*, *G. microcephala*.

*Perdita subfasciata* Cockerell, 1897. Ann. and Mag. Nat. Hist. (6) 20: 512. ♀.

Taxonomy: Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 4, 11, 45-46, figs. 779, 780, 868. ♀, ♂ (key, redescription, geogr. and floral records). — Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 107 (geogr. and floral records).

**thermophila thermophila** Timberlake. South. Calif. (Colorado and Mojave Deserts). Pollen: Possibly an oligolege of *Eriogonum*, visits flowers of *E. deserticola*, *E. hirtella*, *E. inflatum*, *E. reniforme*, *E. thomasi*.

*Perdita thermophila thermophila* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 77, figs. 815, 816, 886. ♀, ♂.

**thermophila trilobata** Timberlake. Ariz., south. Calif. (Mojave Desert). Pollen: Possibly an oligolege of *Eriogonum*, visits flowers of *Baileya*, *Eriogonum deflexum*, *E. densum*, *E. deserticola*, *E. trichopes*.

*Perdita thermophila trilobata* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 78. ♀, ♂.

**timberlakei** Cockerell. South. Calif. (cismontane and adjacent desert areas). Pollen: Evidently depends mostly upon the pollen and nectar of *Eriogonum gracile*, but also visits flowers of *Brassica*, *Eriogonum fasciculatum*, *E. mohavense*, *E. virgatum*.

*Perdita timberlakei* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 194. ♀, ♂.

Taxonomy: Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 6, 13, 70-71, figs. 807, 808, 882. ♀, ♂ (key, redescription, geogr. and floral records).

**varleyi niveipennis** Timberlake. Calif. (San Benito County). Pollen: Apparently an oligolege of *Eriogonum* including *E. inflatum*.

*Perdita varleyi niveipennis* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 86. ♀, ♂.

**varleyi varleyi** Timberlake. South. Calif. (Mojave Desert, western margin). Pollen: Apparently an oligolege of *Eriogonum*, visits flowers of *E. fasciculatum* var. *polifolium*, *E. inflatum*.

*Perdita varleyi varleyi* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 85, figs. 825, 826, 891, 904. ♂, ♀.

*vicina* Timberlake. Nev. (Charleston Mts.). Pollen: Unknown, but visits flowers of *Fallugia paradoxa*.

*Perdita vicina* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 31, figs. 753, 754, 855. ♂.

*viridinotata* Timberlake. N. Mex. (Alamogordo).

*Perdita viridinotata* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 16, figs. 735, 736, 846. ♀, ♂.

*wheeleri* Timberlake. Ariz. (Grand Canyon). Pollen: Unknown, but possibly may visit flowers of *Mentzelia*.

*Perdita wheeleri* Timberlake, 1928. Amer. Mus. Novitates 321: 5. ♂.

Taxonomy: Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 10, 32, figs. 755, 756, 856. ♂ (redescription, possible pollen source).

*wootonae* Cockerell. N. Mex., Colo., Kans., Nebr. Pollen: Apparently an oligolege of *Mentzelia* including *M. decapetala*, *M. nuda*, but visits other flowers presumably for nectar including *Eriogonum effusum*, *Tragopogon porrifolius*.

*Perdita wootonae* Cockerell, 1898. Ent. News 9: 215. ♀, ♂.

Taxonomy: Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 2, 8, 15-16, figs. 733, 734, 845. ♀, ♂ (key, redescription, geogr. and floral records).

*xanthoxyli* Timberlake. Tex. (Corpus Christi State Park); Mexico (Puebla). Pollen: Unknown, but visits flowers of *Xanthoxylon*.

*Perdita xanthoxyli* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 107, figs. 15, 1261, 1262, 1334. ♀, ♂.

*xerophila discrepans* Timberlake. Nev. (Clark County). Pollen: Possibly an oligolege of *Eriogonum*, visits flowers of *E. fasciculatum*, *E. trichopes*.

*Perdita xerophila discrepans* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 84, figs. 823, 824, 890. ♀, ♂.

*xerophila fuscicornis* Timberlake. Calif. (Inyo County Mts.). Pollen: Possibly an oligolege of *Eriogonum*, visits flowers of *E. inflatum*, *Larrea tridentata*.

*Perdita xerophila fuscicornis* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 84, fig. 903. ♀, ♂.

*xerophila xerophila* Timberlake. Ariz. (Yuma County), south. Calif. (Colorado Desert). Pollen: Possibly an oligolege of *Eriogonum*, visits flowers of *E. inflatum*, *E. trichopes*.

*Perdita xerophila xerophila* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 82, fig. 902. ♀, ♂.

*yosemitensis* Timberlake. Calif. (Sierra Nevada Mts.). Pollen: Possibly an oligolege of *Eriogonum*, visits flowers of *E. nudum*, *E. wrightii*.

*Perdita yosemitensis* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 63, figs. 801, 802, 879. ♂, ♀.

#### SPECIES GROUP SPHAERALCEAE

Taxonomy: Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 1 (key). —Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 126-158 (key to included spp.). —Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 38-42 (suppl. key to included spp.).

*adustiventris* Timberlake. South. Calif. (Parker Dam); Mexico (Baja California: Angel de la Guardia Island). Pollen: Unknown, but visits flowers of *Eucnide urens*, *Mentzelia hirsutissima*.

*Perdita adustiventris* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 166. ♀.

Taxonomy: Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 42-43, figs. 5, 1385, 1386, 1411. ♂ (geogr. and floral records).

*albiventris* Timberlake. Tex. (Pecos County). Pollen: Unknown, but the type specimen bears a load of fine, mealy fulvous pollen, probably leguminaceous.

*Perdita albiventris* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 294, fig. 60. ♀.

*albofasciata* Timberlake. N. Mex. (Santa Fe). Pollen: Unknown, but visits flowers of *Tamarix gallica*.

*Perdita albofasciata* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 152. ♀.

- ambigua** Timberlake. Nev. (Lander and Washoe Counties), Calif. (Siskiyou County). Pollen: Unknown, but visits flowers of *Chrysothamnus nauseosus* var. *consimilis*, *Cirsium lanceolatum*.  
*Perdita ambigua* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 311. ♀.
- Taxonomy: Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 54-55. ♂ (geogr. and floral records).
- amicula** Timberlake. Ariz. (Willcox). Pollen: Unknown, but visits flowers of *Aplopappus hartwegi*.  
*Perdita amicula* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 295. ♀.
- ancoralis** Timberlake. South. Calif. (Boyd Desert Research Center).  
*Perdita ancoralis* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 155. ♀.
- ashmeadi ashmeadi** Cockerell. Tex. (Brownsville); Mexico (Sonora). Pollen: Unknown, but visits flowers of *Prosopis*.  
*Perdita ashmeadi* Cockerell, 1899. Ann. and Mag. Nat. Hist. (7) 8: 492. ♀.  
*Perdita exclamans atramentata* Cockerell, 1923. Calif. Acad. Sci., Proc. (4) 12: 96. ♂.
- Taxonomy: Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 141, 158, 324-325, figs. 1069, 1070, 1178. ♀, ♂ (key, redescription, synonymy, geogr. and floral records).
- ashmeadi simulans** Timberlake. South. Calif. (Colorado Desert), ?Ariz. (Sentinel); Mexico (Baja California). Pollen: Unknown, but visits flowers of *Geraea canescens*, *Larrea tridentata*, *Prosopis juliflora*.  
*Perdita ashmeadi simulans* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 326, figs. 1071, 1072, 1179. ♂.
- ashmeadi vierecki** Cockerell. West. Tex., N. Mex. (Alamogordo), Ariz. Pollen: Unknown, but visits flowers of *Mimosa*, *Prosopis*.  
*Perdita Vierecki* Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 20: 129. ♀, ♂.
- Taxonomy: Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 141, 158, 325-326. ♀, ♂ (key, redescription, tax. status, geogr. and floral records).
- assimilis** Timberlake. Calif. (Fresno County). Pollen: Unknown, but visits flowers of *Melilotus*.  
*Perdita assimilis* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 228, figs. 37, 987, 988, 1137. ♀, ♂.
- atrata** Timberlake. Calif. (Colorado and Mojave Deserts). Pollen: Unknown, but visits flowers of *Camissonia brevipes*, *C. dentata* var. *parishii*, *Chaenactis stevioides*, *Mentzelia affinis*, *M. albicaulis*, *M. veatchiana*, *Sphaeralcea ambigua*.  
*Perdita atrata* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 163, figs. 3, 911, 912, 1009. ♀, ♂.
- barri** Timberlake. Idaho (Midvale). Pollen: Unknown, but visits flowers of *Phacelia*.  
*Perdita barri* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 251, figs. 1013, 1014, 1150. ♂.
- blanda** Timberlake. N. Mex. (Albuquerque).  
*Perdita blanda* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 358. ♀.
- Taxonomy: Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 137, 262 (key, tax. status).
- calloleuca calloleuca** Cockerell. N. Mex., Colo., Utah, Ariz. Pollen: Unknown, but visits flowers of *Artemisia filifolia*, *Chrysothamnus*, *Cleome lutea*, *Eriogonum*, *Salsola kali*, *Tamarix*, *Trifolium*, *Wislizenia refracta*.  
*Perdita calloleuca* Cockerell, 1922. Amer. Mus. Novitates 33: 12. ♂.
- Taxonomy: Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 140, 154, 298-300, figs. 63, 1059, 1060, 1173. ♀, ♂ (key, redescription, geogr. and floral records). — Timberlake, 1966. Calif. Univ. Pubs. Ent. 66: 43 (geogr. and floral records).
- calloleuca convergens** Timberlake. N. Mex. (Virden), Ariz. (Graham and Yuma Counties), Nev. (Clark County). Pollen: Unknown, but visits flowers of *Atriplex canescens*, *Chenopodium oblongifolium*, *Euphorbia*, *Suaeda*, *Wislizenia refracta*.  
*Perdita calloleuca convergens* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 300. ♀, ♂.
- chihuahua** Timberlake. N. Mex. (Rodeo); Mexico (Chihuahua and Zacatecas).  
*Perdita chihuahua* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 203, figs. 955, 956, 1121. ♀, ♂.

- chionostoma** Timberlake. Calif. (Fresno County). Pollen: Unknown, but visits flowers of *Melilotus*.  
*Perdita chionostoma* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 240, figs. 43, 1001, 1002, 1144. ♀, ♂.
- cleomellae** Cockerell. Calif. (Mojave Desert). Pollen: Apparently an oligolege of *Cleomella* including *C. obtusifolia*.  
*Perdita cleomellae* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 193. ♀, ♂.  
 Taxonomy: Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 309, 315, 353-354, figs. 430, 431, 499. ♀, ♂ (key, redescription, geogr. and floral records).
- cochiseana** Timberlake. Ariz. (Douglas). Pollen: Unknown, but visits flowers of *Euphorbia*.  
*Perdita cochiseana* Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 43. ♀.
- compta** Timberlake. South. Calif. (Colorado and Mojave Deserts). Pollen: Unknown, but most likely source is *Eriastrum*; visits flowers of *Cryptantha intermedia*, *Eriastrum virgatum*, *Eriogonum reniforme*, *E. trichopes*, *Lepidium fremontii*, *Malacothrix glabrata*, *Stillingia paucidentata*.  
*Perdita compta* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 236, figs. 41, 997, 998, 1142. ♀, ♂.
- confusa** Timberlake. West. Tex., N. Mex., Ariz.; Mexico (Chihuahua). Pollen: Apparently an oligolege of *Lepidium* including *L. alyssoides*, *L. montanum*, *L. thurberi*.  
*Perdita confusa* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 247, figs. 46, 1007, 1008, 1147. ♀, ♂.  
 Taxonomy: Rozen, 1966. Amer. Mus. Novitates 2259: 19, fig. 50 (larva, as questionably this species).  
 Biology: Rozen, 1967. Amer. Mus. Novitates 2297: 38, fig. 15, table 1 (nest architecture, life history, floral association).
- covilleae** Timberlake. Ariz., Utah (St. George), Nev. (Las Vegas), south. Calif. (Colorado and Mojave Deserts); Mexico (Baja California). Pollen: Oligolege of *Larrea tridentata*, also visits other flowers for nectar including *Heliotropium curassavicum*, *Prosopis*.  
*Perdita covilleae* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 361, figs. 438, 439, 503. ♀, ♂.  
 Taxonomy: Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 139, 262 (key).  
 Biology: Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 24, fig. 5 (intrafloral ecology).
- cruciferarum** Timberlake. Nev. (Battle Mountain). Pollen: Unknown, but visits flowers of an unidentified Cruciferae.  
*Perdita cruciferarum* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 140, figs. 24, 25, 1291, 1292, 1349. ♀, ♂.
- cushmani** Timberlake. Tex. (Brewster and Hudspeth Counties); Mexico (Chihuahua). Pollen: Unknown, but visits flowers of *Gutierrezia*, *Prosopis juliflora*.  
*Perdita cushmani* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 222, figs. 979, 980, 1133. ♀, ♂.
- cuspidata** Timberlake. South. Calif. (Colorado and Mojave Deserts). Pollen: Collects pollen from the flowers of *Nama demissum*, *Phacelia distans*, but visits other flowers for nectar including *Oenothera*.  
*Perdita cuspidata* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 231, figs. 39, 991, 992, 1139. ♀, ♂.
- dammersi** Timberlake. South. Calif. (Colorado and Mojave Deserts). Pollen: Collects pollen from flowers of *Malacothrix* including *M. glabrata*, but visits these and other flowers for nectar including *Chaenactis fremontii*, *Stephanomeria exigua*.  
*Perdita dammersi* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 169, figs. 7, 919, 920, 1103. ♀, ♂.
- davidsoni** Timberlake. South. Calif.  
*Perdita davidsoni* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 235, figs. 995, 996, 1141. ♂.

- deltophora** Timberlake. Tex. Pollen: Unknown, but visits flowers of *Chamaesaracha conioides*, *Physalis lobata*, *Prosopis*.  
*Perdita deltophora* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 207, figs. 25, 959, 960, 1123. ♀, ♂.
- dentata** Timberlake. South. Calif. (Colorado Desert). Pollen: Possibly an oligolege of *Phacelia* including *P. distans*, but visits other flowers presumably for nectar including *Acacia greggii*, *Geraea canescens*, *Krameria canescens*, *Larrea tridentata*.  
*Perdita dentata* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 165, figs. 4, 913, 914, 1100. ♀, ♂.
- difficilis** Timberlake. Tex. (Brewster County), N. Mex. (Dona Ana and Eddy Counties), Ariz., south. Calif. (Colorado and Mojave Deserts); Mexico (Baja California). Pollen: Apparently an oligolege of *Prosopis* including *P. juliflora*, but visits flowers of other desert shrubs presumably for nectar including *Cercidium floridum*, *Larrea tridentata*, *Mimosa* and also has been collected at the flowers of *Melilotus*.  
*Perdita difficilis* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 323, figs. 1067, 1068, 1177. ♂, ♀.
- digna** Timberlake. Calif. (Quincy).  
*Perdita digna* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 310. ♀.
- discors** Timberlake. South. Calif. (Thousand Palms).  
*Perdita discors* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 361. ♀.
- dispar** Timberlake. Tex. (Starr and Webb Counties); Mexico (Chihuahua). Pollen: Unknown, but visits flowers of *Condalia lycioides*, *Croton*, *Prosopis juliflora*.  
*Perdita dispar* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 220, figs. 33, 997, 998, 1132. ♀, ♂.
- Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 43: 136 (geogr. and floral record).
- distincta** Timberlake. Oreg. (Baker County), Calif. (Sierra County). Pollen: Unknown, but visits flowers of *Eriogonum*.  
*Perdita distincta* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 174, figs. 10, 925, 926, 1106. ♂.
- Taxonomy: Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 45-46. ♀.
- drymariae** Timberlake. N. Mex. (Dona Ana and Hidalgo Counties), Mich. (Baraga County); Mexico (San Luis Potosi). Pollen: Unknown, but visits flowers of *Drymaria holosteoides*, *Tidestromia lanuginosa*.  
*Perdita drymariae* Timberlake, 1960. In Mitchell, N. C. Agr. Expt. Sta. Tech. Bul. 141: 324. ♀, ♂.
- Taxonomy: Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 129, 148, 201-202, figs. 22, 951, 952, 1119. ♀, ♂ (key, tax. characters, geogr. and floral records). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 112, 134 (key, geogr. and floral record).
- emarginata** Timberlake. Ariz. (Tucson), south. Calif. (Desert Center). Pollen: Unknown, but visits flowers of *Dalea*.  
*Perdita emarginata* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 304. ♀.
- eremica** Timberlake. Ariz. (Maricopa and Pinal Counties), south. Calif. (Colorado and Mojave Deserts). Pollen: Apparently an oligolege of *Larrea tridentata*, but visits other flowers including *Dalea californica*, *D. fremontii* var. *johnsonii*, *D. f.* var. *saundersii*, *D. schottii*, *Eriogonum inflatum*, *Funastrum hirtellum*, *Hyptis emoryi*, *Nama demissum*.  
*Perdita eremica* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 268, figs. 54, 1033, 1034, 1160. ♀, ♂.
- Biology: Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 25 (floral relationships).
- eremophila** Timberlake. South. Calif. (Mojave Desert). Pollen: Possibly an oligolege of *Phacelia* including *P. distans*, *P. fremontii*, but visits other flowers including *Haplopappus cooperi*, *Lepidium fremontii*.  
*Perdita eremophila* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 238, figs. 42, 999, 1000, 1143. ♀, ♂.

- eriastri** Timberlake. South. Calif. (cismontane). Pollen: Collects pollen from the flowers of *Eriastrum* including *E. virgatum*, but visits other flowers for nectar including *Cryptantha intermedia*, *Eriogonum fasciculatum*, *Gilia*.  
*Perdita eriastri* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 233, figs. 40, 993, 994, 1140. ♀, ♂.
- eriastri var. fusciventris** Timberlake. South. Calif. (Palm Springs). Pollen: Collects pollen from flowers of *Eriastrum virgatum*. A specimen similar to the holotype has been collected in Arroyo Seco, Los Angeles County at the flowers of *Eriodictyon parryi*.  
*Perdita eriastri* var. *fusciventris* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 235. ♀.
- eucnides eucnides** Timberlake. Calif. (Inyo County), Nev. (Churchill County). Pollen: Polylectic, collects pollen from the flowers of *Cowania mexicana* var. *stansburiana*, *Dalea polyadenia*, *Eucnide urens*, *Larrea tridentata*, but also visits other flowers including *Eriogonum inflatum* possibly for nectar.  
*Perdita eucnides eucnides* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 301, figs. 64, 1061, 1062, 1174. ♂, ♀.
- eucnides platyzona** Timberlake. Ariz. (Yuma County), south. Calif. (Colorado Desert); Mexico (Baja California). Pollen: Polylectic, visits flowers of *Acacia greggii*, *Larrea tridentata*, *Pluchea sericea*, *Sesuvium verrucosum*.  
*Perdita eucnides platyzona* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 304. ♀, ♂.
- euzonata** Timberlake. Ariz. (Painted Desert). Pollen: Unknown, but visits flowers of *Eriogonum aureum*.  
*Perdita euzonata* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 295. ♀.
- exclamans** Cockerell. West. Tex. to south. Calif. (Colorado and Mojave Deserts) and south Nev. (Clark County); Mexico (Baja California and Sonora). Pollen: Collects pollen from the flowers of *Prosopis*, but also visits other flowers presumably for nectar including *Baccharis*, *Cercidium floridum*, *Dithyrea wislizeni*, *Larrea tridentata*, *Melilotus*, *Mimosa*, *Phoradendron*.  
*Perdita nitidella* var. *exclamans* Cockerell, 1895. Psyche 1 (sup.): 5. ♂.
- Taxonomy: Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 141, 157, 158, 320-323, figs. 70, 1065, 1066, 1176. ♂, ♀ (key, redescription, geogr. and floral records).
- exigua becki** Timberlake. Nev. (Nye and White Pine Counties).  
*Perdita exigua becki* Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 44. ♀, ♂.
- exigua exigua** Timberlake. Calif. (Hallelujah Junction).  
*Perdita exigua* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 278, figs. 1043, 1044, 1165. ♀, ♂.
- Taxonomy: Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 44 (tax. status).
- eximia** Timberlake. Ariz. (Maricopa and Yuma Counties), south. Calif. (Colorado and Mojave Deserts), Nev. (Esmeralda County). Pollen: Possibly an oligolege of *Phacelia* including *P. crenulata*, but visits a variety of other flowers including *Acacia greggii*, *Camissonia clavaeformis*, *Cryptantha angustifolia*, *Cercidium floridum*, *Dalea schottii*, *Encelia*, *Eriogonum inflatum*, *E. thomasi*, *Heliotropium curassavicum*, *Isomeris arborea*, *Larrea tridentata*, *Prosopis juliflora*.  
*Perdita eximia* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 255, figs. 49, 1019, 1020, 1153. ♀, ♂.
- Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 145 (key).
- eysenhardtiae** Timberlake. Tex. (Alpine), Ariz. (Cochise and Santa Cruz Counties); Mexico (Distrito Federal, Durango and Hidalgo). Pollen: Unknown, but visits flowers of *Baccharis glutinosa*, *Eysenhardtia polystachya*.  
*Perdita eysenhardtiae* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 215. ♀.
- falcata** Timberlake. Calif. (Inyo County). Pollen: Unknown, but visits flowers of *Dalea fremontii*, *Encelia farinosa*, *Gilia*, *Sphaeralcea*.  
*Perdita falcata* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 161, figs. 2, 909, 910, 1098. ♀, ♂.



**flavipes** Timberlake. South. Calif. (Colorado and Mojave Deserts); Mexico (Baja California).

Pollen: Apparently an oligolege of *Larrea tridentata*, but visits other flowers including *Heliotropium curassavicum*, *Prosopis juliflora*.

*Perdita flavipes* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 259, figs. 50, 1023, 1024, 1155. ♂, ♀.

Biology: Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 24 (floral relationships).

**florissantella** Cockerell. Colo., N. Mex. (Taos County). Pollen: Collects pollen from the flowers of *Lepidium jonesi*, but visits other flowers presumably for nectar including *Chenopodium album*, *Eriogonum umbellatum*, *Phacelia*.

*Perdita florissantella* Cockerell, 1906. Amer. Mus. Nat. Hist., Bul. 22: 440. ♂, ♀.

*Perdita lepidii* Cockerell, 1907. Entomologist 40: 266. ♀.

*Perdita opacifrons* Timberlake, 1929. N. Y. Ent. Soc., Jour. 37: 113. ♂.

Taxonomy: Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 137, 151, 242-244, figs. 44, 1003, 1004, 1145. ♀, ♂ (key, redescription, synonymy, geogr. and floral records). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 139 (key).

**foxi** Cockerell. N. Mex. (Santa Fe).

*Perdita foxi* Cockerell, 1895. Acad. Nat. Sci. Phila., Proc. 47: 18. ♂.

Taxonomy: Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 152, 317. ♂ (key, redescription).

**gemella** Timberlake. Calif. (Apple Valley and Deep Creek on Mojave Desert). Pollen:

Unknown, but visits flowers of *Eriodictyon trichocalyx*.

*Perdita gemella* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 200, figs. 949, 950, 1118. ♂.

**geminata** Timberlake. N. Mex. (Otero County). Pollen: Unknown, but visits flowers of *Larrea tridentata*.

*Perdita geminata* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 251, figs. 1015, 1016, 1151. ♀, ♂.

**genalis genalis** Timberlake. South. Calif. (Colorado and Mojave Deserts). Pollen: Unknown, but visits flowers of *Acacia greggii*, *Cercidium floridum*, *Larrea tridentata*, *Prosopis juliflora*.

*Perdita genalis genalis* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 359, figs. 76, 1093, 1094, 1190. ♀, ♂.

**genalis panamintensis** Timberlake. Calif. (Panamint Mts.). Pollen: Unknown, but visits flowers of *Larrea tridentata*, *Prosopis juliflora*, *Stanleya pinnata*.

*Perdita genalis panamintensis* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 360. ♀, ♂.

**gracilis** Timberlake. Calif. (Lone Pine). Pollen: Unknown, but visits flowers of *Malacothrix*.

*Perdita gracilis* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 309. ♀.

**greggiae** Timberlake. Tex. (Reeves County), N. Mex. (Eddy County). Pollen: Unknown, but visits flowers of *Lepidium montanum*, *Lesquerella gordonii*, *Nerisyrenia camporum*.

*Perdita greggiae* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 142, figs. 1293, 1294, 1350. ♀, ♂.

**heliotropii heliotropii** Cockerell. Tex. (El Paso) west to south. Calif. (Colorado and Mojave Deserts), Nev. (Lyon County), Utah (St. George); Mexico (Baja California, Sonora, Chihuahua). Pollen: Collects pollen from the flowers of *Heliotropium* including *H. curassavicum*, but visits these and other flowers for nectar including *Larrea tridentata*, *Salix*, *Tamarix*.

*Perdita heliotropii* Cockerell, 1900. Entomologist 33: 63. ♀, ♂.

Taxonomy: Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 309, 314, 364-365, figs. 442, 443, 505, 521. ♀, ♂ (key, tax. characters, tax. status, geogr. and floral records). —Timberlake, 1964.

Calif. Univ. Pubs. Ent. 28: 139, 262 (key, tax. characters). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 116, 148 (key, tax. characters, geogr. record).

**heliotropii perducta** Timberlake. Central Calif. Pollen: Collects pollen from the flowers of *Heliotropium curassavicum*, but also visits flowers of *Stanleya pinnata* presumably for nectar.

*Perdita heliotropii perducta* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 365. ♀, ♂.

Taxonomy: Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 139, 262 (key, geogr. and floral record).

**humilis** Timberlake. N. Mex. (Mesilla Park). Pollen: Unknown, but visits flowers of *Dithyrea wislizeni*.

*Perdita humilis* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 156. ♀.

**imberbis** Timberlake. Calif. (Sierra and Siskiyou Counties). Pollen: Unknown, but visits flowers of *Erigeron*.

*Perdita imberbis* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 139, fig. 23. ♀.

Taxonomy: Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 46-47, figs. 1387, 1388, 1412. ♂, ♀ (key, geogr. and floral record).

**impigra** Timberlake. Tex. (San Jacinto County).

*Perdita impigra* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 157, fig. 31. ♀.

**impressa** Timberlake. Ariz. (Apache County). Pollen: Unknown, but visits flowers of *Eriogonum aureum*.

*Perdita impressa* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 153. ♀.

**incompta** Timberlake. Tex. (Southmost). Pollen: Unknown, but visits flowers of *Lippia*.

*Perdita incompta* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 208, figs. 26, 961, 962, 1124. ♀, ♂.

**infelix** Timberlake. Nebr. (Harrison).

*Perdita infelix* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 314. ♀.

**innotata** Timberlake. Ariz. (Maricopa and Yuma Counties), south. Calif. (Colorado and Mojave Deserts). Pollen: Possibly an oligolege of *Prosopis* including *P. juliflora*, but also visits flowers of *Nama hispidum*.

*Perdita innotata* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 333, figs. 1081, 1082, 1184. ♀, ♂.

**insequens** Timberlake. South. Calif. (Piute Butte in Mojave Desert). Pollen: Unknown, but visits flowers of *Chaenactis brachypappa*.

*Perdita insequens* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 146, fig. 27. ♀.

**koebelei concinna** Timberlake. South. Calif. (Colorado and Mojave Deserts), Ariz. (Mohave and Yuma Counties). Pollen: Apparently an oligolege of *Mentzelia* including *M. involucreta*, *M. tricuspis*, but also visits flowers of *Eucnide urens*, *Hyptis emoryi*.

*Perdita koebelei concinna* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 161, figs. 907, 908. ♂, ♀.

*Perdita masoni* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 306. ♀.

Taxonomy: Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 47 (synonymy, geogr. and floral records).

**koebelei koebelei** Timberlake. Calif. (Inyo County). Pollen: Collects pollen from the flowers of *Eucnide urens*, *Mentzelia*, but also visits other flowers presumably for nectar including *Argemone platyceras*, *Encelia farinosa*, *Eriogonum inflatum*, *Phacelia calthifolia*, *Stephanomeria*.

*Perdita koebelei koebelei* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 159, figs. 1, 905, 906, 1097. ♂, ♀.

**krombeini** Timberlake. Fla. (Lee County).

*Perdita krombeini* Timberlake, 1960. In Mitchell, N. C. Agr. Expt. Sta. Tech. Bul. 141: 327. ♂.

Taxonomy: Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 144, 167, figs. 915, 916, 1101. ♂ (key, tax. characters).

**leucogastra** Timberlake. Tex. (Terrell County). Pollen: Unknown, but visits flowers of *Gilia acerosa*.

*Perdita leucogastra* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 280, figs. 1045, 1046, 1166. ♀, ♂.

**leucosticta** Timberlake. South. Calif. (San Jacinto Mts. and environs). Pollen: Possibly an oligolege of *Eriastrum virgatum*, but visits other flowers including *Eriogonum fasciculatum*, *Gilia exilis*, *Layia platyglossa*.

*Perdita leucosticta* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 224, figs. 34, 981, 982, 1134. ♀, ♂.

- linsleyi** Timberlake. South. Calif. (Los Angeles and Ventura Counties). Pollen: Unknown, but visits flowers of *Chaenactis*, *Euphorbia albomarginata*, *Lasthenia chrysostoma*.  
*Perdita linsleyi* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 199, figs. 21, 947, 948, 1117. ♀, ♂.
- luciae decora** Timberlake. Ariz. (Maricopa, Pima and Yuma Counties), Nev. (Clark County), south. Calif. (Colorado Desert); Mexico (Baja California and Sonora). Pollen: Polylectic, especially flowers of *Larrea tridentata* and *Prosopis juliflora*, but also visits a wide variety of other flowers including *Acacia greggii*, *Baileya pleniradiata*, *Cercidium floridum*, *Cryptantha angustifolia*, *C. intermedia*, *Nama hispidum*, *Psilostrophe cooperi*, *Sphaeralcea emoryi*.  
*Perdita luciae decora* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 336, fig. 73. ♀, ♂.
- Biology: Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 25 (floral relationships).
- luciae luciae** Cockerell. Tex. (Pecos County), N. Mex. (Las Cruces), Ariz. (Cochise, Maricopa and Pima Counties); Mexico (Sonora). Pollen: Unknown, but visits flowers of *Medicago sativa*, *Mimosa*, *Prosopis*.  
*Perdita luciae* Cockerell, 1899. Ann. and Mag. Nat. Hist. (7) 3: 494. ♂.
- Taxonomy: Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 141, 156, 157, 334-336, figs. 72, 1083, 1084, 1185 (key, tax. status, redescription, geogr. and floral records).
- lycii** Timberlake. Ariz. (Pima County). Pollen: Unknown, but visits flowers of *Lycium*.  
*Perdita lycii* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 305, fig. 65. ♀.
- macneilli** Timberlake. Calif. (Santa Clara County).  
*Perdita macneilli* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 312. ♀.
- macswaini** Timberlake. Tex. (Cameron and Harlingen Counties), N. Mex. (Eddy County). Pollen: Unknown, but visits flowers of *Coreopsis douglasii*, *Gaillardia*, *Monarda citriodora*, *Prosopis*.  
*Perdita macswaini* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 289, figs. 1053, 1054, 1170. ♀, ♂.
- macswaini var. flavolineata** Timberlake. Tex. (Hidalgo County).  
*Perdita macswaini var. flavolineata* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 290. ♂.
- martini** Cockerell. West. Tex., N. Mex. (Dona Ana County). Pollen: Unknown, but visits flowers of *Sesuvium verrucosum*.  
*Perdita martini* Cockerell, 1895. Acad. Nat. Sci. Phila., Proc. 47: 14. ♂.
- Taxonomy: Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 140, 155, 287, figs. 58, 1051, 1052, 1169. ♀, ♂ (key, tax. status, redescription, geogr. and floral records).
- melanogastra** Timberlake. Calif. (Tulare County).  
*Perdita melanogastra* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 313, fig. 67. ♀.
- mimosae** Timberlake. Tex., N. Mex. (Eddy County). Pollen: Unknown, but visits flowers of *Mimosa*, *Phacelia popei*, *Prosopis*.  
*Perdita mimosae* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 270, figs. 1035, 1036, 1161. ♀, ♂.
- modestissima** Timberlake. Nev. (Battle Mountain). Pollen: Unknown, but holotype is labeled from an undetermined species of Cruciferae.  
*Perdita modestissima* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 147, fig. 28. ♀.
- munita** Timberlake. Ariz. (Cochise County); Mexico (Durango). Pollen: Unknown, but visits flowers of *Chamaesaracha coronopus*, *Eriogonum*, *Physalis*.  
*Perdita munita* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 205, figs. 24, 957, 958, 1122. ♀, ♂.
- nigricornis** Timberlake. Ariz. (Cochise and Pima Counties); Mexico (Sonora). Pollen: Apparently may collect pollen from the flowers of *Prosopis*.  
*Perdita nigricornis* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 331, figs. 1077, 1078, 1182. ♂.
- nigroaenea** Timberlake. Utah (Kane County). Pollen: Unknown, but visits flowers of *Gutierrezia microcephala*.  
*Perdita nigroaenea* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 158. ♀.

**nigroclypeata** Timberlake. Colo. (Alamosa and Rio Grande Counties).

*Perdita nigroclypeata* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 314, fig. 69. ♀.

**obliqua** Timberlake. Ark. (Garland County), Ariz., south. Calif. (Colorado Desert); Mexico (Baja California and Sonora). Pollen: Apparently polylectic, visits flowers of *Acacia*, *Carnegiea gigantea*, *Cercidium*, *Dalea spinosa*, *Eriogonum trichopes*, *Medicago sativa*, *Prosopis*, *Wislizenia refracta*.

*Perdita obliqua* Timberlake, 1928. Pan-Pacific Ent. 5: 26. ♀.

Taxonomy: Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 134, 144, 148, 218-219, figs. 975, 976, 1131. ♀, ♂ (key, redescription, geogr. and floral records). — Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 48 (geogr. record).

**obscurella** Timberlake. N. Mex. (Hidalgo and Socorro Counties), Ariz. (Cochise and Pima Counties); Mexico (Chihuahua). Pollen: Unknown, but visits flowers of *Baileya pleniradiata*, *Boerhaavia*, *Euphorbia albomarginata*.

*Perdita obscurella* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 202, figs. 23, 593, 594, 1120. ♀, ♂.

**omani** Timberlake. Calif. (Bakersfield).

*Perdita omani* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 296, fig. 62. ♀.

**oreophila** Timberlake. Calif. (Tuolumne County). Pollen: Unknown, but visits flowers of a *Compositae*.

*Perdita oreophila* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 244. ♀.

**ovaliceps** Timberlake. N. Mex. (Eddy County), Ariz. (Maricopa and Mohave Counties), Nev. (Clark County), south. Calif. (Colorado and Mojave Deserts). Pollen: Unknown, but visits flowers of *Chaenactis carphoclinia*, *C. stevioides* var. *brachypappa*, *Encelia farinosa*, *Gerrea canescens*, *Larrea tridentata*.

*Perdita ovaliceps* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 265, figs. 52, 1029, 1030, 1158. ♂.

*Perdita luctuosa* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 266, fig. 53. ♀.

Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 150-151 (synonymy, geogr. records).

**pallidipes** Timberlake. Ariz. (Maricopa and Pima Counties), south. Calif. (Colorado Desert); Mexico (Sonora). Pollen: Unknown, but visits flowers of *Prosopis juliflora*.

*Perdita pallidipes* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 332, figs. 1079, 1080, 1183. ♂.

**panocheana** Timberlake. Calif. (Fresno County). Pollen: Unknown, but visits flowers of *Heliotropium oculatum*.

*Perdita panocheana* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 274, figs. 1039, 1040, 1163. ♀, ♂.

**parryellae** Timberlake. Ariz. (Navajo County). Pollen: Unknown, but visits flowers of *Parryella filifolia*.

*Perdita parryellae* Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 48, figs. 1389, 1390, 1413. ♀, ♂.

**placens** Timberlake. Ariz. (Willcox).

*Perdita placens* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 124, figs. 1273, 1274, 1340. ♂.

**planifrons** Timberlake. Calif. (Mono County).

*Perdita planifrons* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 148. ♀.

**propinqua** Timberlake. Calif. (Ventura County). Pollen: Unknown, but visits flowers of *Linanthus aureus*, *Phacelia douglasii*.

*Perdita propinqua* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 226, figs. 35, 983, 984, 1135. ♀, ♂.

**prospodidis** Timberlake. Ariz. (Yuma County), south. Calif. (Colorado and Mojave Deserts); Mexico (Baja California). Pollen: Possibly an oligolege of *Prosopis juliflora*, but visits other flowers for nectar including *Melilotus*.

*Perdita prospodidis* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 318, figs. 69, 1063, 1064, 1175. ♀, ♂.

**puncticeps** Timberlake. Calif. (Palm Springs).

*Perdita puncticeps* Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 49. ♀.

- punctosignata flava** Timberlake. Tex. west. to Ariz.; Mexico (Baja California, Chihuahua, Coahuila, Sonora and Sinaloa). Pollen: Apparently an oligolege of *Prosopis*, but also visits other flowers presumably for nectar including *Gutierrezia*, *Medicago*, *Sapindus saponaria*.  
*Perdita punctosignata flava* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 354. ♀, ♂.
- punctosignata punctosignata** Cockerell. N. Mex. (Dona Ana and Otero Counties), Ariz., Calif. (Colorado Desert); Mexico (Baja California and Sonora). Pollen: Apparently an oligolege of *Prosopis*.  
*Perdita punctosignata* Cockerell, 1895. Psyche 7 (supp.): 6. ♂.  
*Perdita howardi* Cockerell, 1899. Ann. and Mag. Nat. Hist. (7) 3: 492. ♀, ♂.
- Taxonomy: Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 142, 157, 351-353, figs. 75, 1087, 1088, 1187. ♀, ♂ (key, redescription, synonymy, geogr. and floral records).
- punctosignata sulphurea** Timberlake. Ariz., south. Calif. (Colorado and Mojave Deserts, also San Benito County), Nev. (Clark County), Utah (Washington County); Mexico (Baja California). Pollen: Apparently an oligolege of *Prosopis*, but also visits other flowers presumably for nectar including *Acacia greggii*, *Cercidium floridum*, *Larrea tridentata*, *Melilotus*.  
*Perdita punctosignata sulphurea* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 353. ♀, ♂.
- punctulata** Timberlake. South. Calif. (Colorado and Mojave Deserts), Ariz. (Yuma); Mexico (Baja California and Sonora). Pollen: Oligolege of *Larrea tridentata*, but also visits other flowers for nectar including *Baccharis emoryi*, *Cercidium floridum*, *Lasthenia chrysostoma*, *Melilotus*, *Prosopis juliflora*.  
*Perdita punctulata* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 362, figs. 440, 441, 504. ♂, ♀.
- Taxonomy: Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 139, 262 (key).
- Biology: Hurd and Linsley, 1975. Calif. Univ. Pubs. Ent. 193: 24-25, fig. 6 (floral relationships).
- pusilla** Timberlake. South. Calif. (western margin of Mojave Desert).  
*Perdita pusilla* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 257, figs. 1021, 1022, 1154. ♀, ♂.
- quadriceps** Timberlake. Ariz. (Patagonia).  
*Perdita quadriceps* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 213, figs. 29, 969, 970, 1128. ♂.
- replicans** Timberlake. Calif. (San Luis Obispo County).  
*Perdita replicans* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 149, fig. 29. ♀.
- richardsi** Timberlake. California (Apple Valley in the Mojave Desert).  
*Perdita richardsi* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 227. ♂.
- salicis coloradana** Timberlake. Colo. (Delta and Garfield Counties).  
*Perdita salicis coloradana* Timberlake, 1929. N. Y. Ent. Soc., Jour. 37: 111. ♀.
- Taxonomy: Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 340, 341. ♀ (key, redescription, geogr. records).
- salicis euxantha** Timberlake. Idaho (Idaho and Nez Perce Counties), Oreg. (near Corvallis).  
*Perdita salicis euxantha* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 349. ♀, ♂.
- salicis hirsutior** Timberlake. Calif. (Olancho). Pollen: Presumably an oligolege of *Salix*, visits the flowers of *S. exigua*.  
*Perdita salicis hirsutior* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 346. ♀, ♂.
- salicis imperialis** Cockerell. Wash. (Asotin, Spokane, Walla Walla and Whitman Counties), Idaho (Blaine, Canyon, Nez Perce and Twin Falls Counties), Oreg. (Umatilla and Walloun Counties), Utah (Cache, Iron, Juab and Washington Counties), south. Calif. (Colorado and Mojave Deserts), Ariz. (Maricopa and Pima Counties), Colo. (Archuleta County). Pollen: Presumably an oligolege of *Salix*, including *S. gooddingii*, but visits other flowers apparently for nectar including *Acacia greggii*, *Asparagus*, *Daucus carota*, *Prosopis*, *Sisymbrium*.  
*Perdita exclamans imperialis* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 193. ♀.

- Taxonomy: Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 340, 342-343. ♀, ♂ (key, redescription, geogr. and floral records).
- salicis laeta** Timberlake. South. Calif. (Needles). Pollen: Presumably an oligolege of *Salix*, visits flowers of *Prosopis juliflora*.
- Perdita salicis laeta* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 347. ♀, ♂.
- salicis monoensis** Timberlake. Calif. (Eldorado and Mono Counties). Pollen: Presumably an oligolege of *Salix*, visits flowers of *S. sessilifolia*.
- Perdita salicis monoensis* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 345. ♀, ♂.
- salicis occidentalis** Timberlake. South. Calif. (cismontane, except one population at Helendale on Mojave Desert). Pollen: Apparently an oligolege of *Salix* including *S. exigua*, *S. gooddingii*, *S. nigra*, but visits other flowers presumably for nectar including *Alyssum maritimum*, *Cryptantha microphylla* var. *lepidia*, *Funastrum heterophyllum*, *Ligustrum*, *Pyracantha*.
- Perdita salicis occidentalis* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 343. ♀, ♂.
- salicis personata** Timberlake. South. Calif. (San Diego County). Pollen: Presumably an oligolege of *Salix*, visits flowers of *S. laevigata*.
- Perdita salicis personata* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 344. ♀, ♂.
- salicis salicis** Cockerell. Colo., N. Mex. (Las Cruces); Mexico (Chihuahua). Pollen: Presumably an oligolege of *Salix*.
- Perdita salicis* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 80. ♀, ♂.
- Taxonomy: Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 138, 141, 157, 338-341, figs. 1085, 1086, 1186. ♀, ♂ (key, redescription, geogr. and floral records).
- salicis sublaeta** Timberlake. Oreg. (Hood River and The Dalles).
- Perdita salicis sublaeta* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 348. ♀, ♂.
- salicis subtristis** Cockerell. Colo. (Archuleta and Chaffee Counties), Utah (Grand County). Pollen: Apparently an oligolege of *Salix*.
- Perdita subtristis* Cockerell, 1933. Canad. Ent. 65: 234. ♀.
- Taxonomy: Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 135, 339, 341-342. ♀, ♂ (key, redescription, geogr. and floral records).
- salicis tristis** Timberlake. Calif. (San Joaquin Valley). Pollen: Apparently an oligolege of *Salix*, visits flowers of *S. hindsiana* and also *Populus*.
- Perdita salicis tristis* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 345, fig. 74. ♀, ♂.
- salviae** Timberlake. South. Calif. (Colorado Desert). Pollen: Collects pollen from the flowers of *Salvia vaseyi*.
- Perdita salviae* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 184, figs. 935, 936, 1111. ♀, ♂.
- sandhouseae** Timberlake. Ariz. (Apache County). Pollen: Unknown, but visits flowers of *Gutierrezia*.
- Perdita sandhouseae* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 171, figs. 8, 921, 922, 1104. ♂.
- schlingeri** Timberlake. Nev. (Emigrant Pass).
- Perdita schlingeri* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 258. ♀.
- semicaerulea** Cockerell. Tex. to Ariz.; Mexico (Chihuahua and Coahuila). Pollen: Oligolege of *Larrea tridentata*, visits both the spring and late summer and fall blooms of this plant from which it obtains pollen and nectar, but also visits flowers of *Prosopis* presumably for nectar only.
- Perdita semicaerulea* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 64. ♀.
- Perdita quadrangularis* Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 20: 129. ♂.
- Taxonomy: Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 131, 150, 186-188, figs. 14, 937, 938, 1112. ♀, ♂ (key, redescription, synonymy, geogr. and floral records).
- Biology: Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 25 (floral relationships).
- sexnotata** Timberlake. South. Calif. (Colorado Desert). Pollen: Unknown, but visits flowers of *Coldenia palmeri*, *Eschscholzia parishii*.
- Perdita sexnotata* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 307, fig. 66. ♀.

*sidæ* Cockerell. N. Mex. (Mesilla); Mexico (Durango). Pollen: Unknown, but visits flowers of *Sida hederacea*.

*Perdita sidæ* Cockerell, 1897. Acad. Nat. Sci. Phila., Proc. 49: 353. ♀, ♂.

Taxonomy: Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 128, 132, 148, 263-264, figs. 51, 1025, 1026, 1156. ♂ (key, redescription). —Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 50. ♀ (redescription, geogr. record).

**sonorensis** Cockerell. Ariz. (Yuma County), south. Calif. (Colorado and Mojave Deserts); Mexico (Baja California and Sonora). Pollen: Oligolege of *Prosopis* including *P. juliflora*, *P. pubescens*, but also visits flowers of *Encelia farinosa*, *Eucnide urens*, *Heliotropium curassavicum*, *Melilotus*, *Peucephyllum schottii*, *Pluchea sericea*.

*Perdita sonorensis* Cockerell, 1899. Ann. and Mag. Nat. Hist. (7) 3: 493. ♀.

Taxonomy: Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 136, 138, 152, 272-274, figs. 55, 1037, 1038, 1162. ♀, ♂ (key, redescription, geogr. and floral records).

**speciosa** Timberlake. Ariz. (Coconino County). Pollen: Unknown, but visits flowers of *Wislizenia refracta*.

*Perdita speciosa* Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 51, figs. 1391, 1392, 1414. ♂.

**sphaeralceæ alticola** Cockerell. N. Mex., Ariz. (Cochise and Coconino Counties). Pollen:

Possibly an oligolege of *Sphaeralcea*, visits flowers of *S. lobata*, but also visits flowers of *Heterotheca subaxillaris*.

*Perdita sphaeralceæ* race *alticola* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 68. ♀, ♂.

*Perdita sphaeralceæ* race *alticola* mut. *suffusa* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 68. ♂.

Taxonomy: Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 154, 178-179, fig. 11. ♀, ♂ (key, geogr. and floral records).

**sphaeralceæ sphaeralceæ** Cockerell. Tex. (Hudspeth County), N. Mex. (Dona Ana and Luna Counties); Mexico (Chihuahua, San Luis Potosi and Zacatecas). Pollen: Possibly an oligolege of *Sphaeralcea* including *S. angustifolia*, but visits other flowers including *Cologetia*, *Gutierrezia lucida*, *Haplopappus heterophyllus*, *Mentzelia*, *Solidago canadensis*.

*Perdita sphaeralceæ* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 66. ♀, ♂.

*Perdita pellucida* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 88. ♂.

*Perdita sphaeralceæ* var. *ridens* Cockerell, 1922. Ann. and Mag. Nat. Hist. (9) 10: 547. ♂.

Taxonomy: Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 121 (tax. status, as *pellucida*).

—Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 127, 154, 176-178. ♀, ♂ (key, redescription, synonymy, geogr. and floral records).

**stathamae eluta** Timberlake. Ariz. (Salt River Mts.).

*Perdita stathamae eluta* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 358. ♀, ♂.

**stathamae stathamae** Timberlake. N. Mex. (Alamogordo), Ariz. (Chihuahua and Sonora Deserts), south. Calif. (Colorado Desert); Mexico (Baja California and Sonora). Pollen: Unknown, but visits flowers of *Acacia greggii*, *Prosopis juliflora*.

*Perdita stathamae stathamae* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 365, figs. 1091, 1092, 1189. ♀, ♂.

**stenopyga** Timberlake. Calif. (Inyo County). Pollen: Unknown, but visits flowers of *Chaenactis*, *Mentzelia affinis*.

*Perdita stenopyga* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 229, figs. 38, 989, 990, 1138. ♀, ♂.

**sternalis** Timberlake. South. Tex. (Cameron and Galveston Counties). Pollen: Unknown, but visits flowers of *Coreopsis douglasii*, *Heliotropium*, *Rubus*.

*Perdita sternalis* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 291, figs. 1055, 1056, 1171. ♀, ♂.

**sulphuripes** Timberlake. Calif. (near Palm Springs, also Slate Mts., Inyo County). Pollen: Unknown, but visits flowers of *Malacothrix*.

*Perdita sulphuripes* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 267, figs. 1031, 1032, 1159. ♂.

- Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 151. ♂ (geogr. and floral record).  
*tarda* Cockerell. N. Mex. (Las Cruces). Pollen: Unknown, but visits flowers of *Gutierrezia microcephala*.  
*Perdita tarda* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 85. ♂.
- Taxonomy: Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 146, 151, 279-280 (redescription of type specimen).  
*tenebrosa* Timberlake. Ariz. (Chiricahua Mts.).  
*Perdita tenebrosa* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 131. ♀.
- tessellata* Timberlake. Idaho (Elmore County), Nev. (Battle Mountain). Pollen: Unknown, but visits flowers of *Chaenactis*, *Tetradymia*.  
*Perdita tessellata* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 264, figs. 1027, 1028, 1157. ♂.
- Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 113, 117, 151-152, fig. 30. ♀, ♂ (key, redescription, geogr. and floral records).
- thelypodii* Timberlake. Calif. (Inyo and Los Angeles Counties). Pollen: Unknown, but visits flowers of *Cleomella obtusifolia*, *Thelypodium brachycarpum*.  
*Perdita thelypodii* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 354, figs. 432, 433, 500. ♀, ♂.
- tortifoliae fremonti* Timberlake. South. Calif. (Mohave Desert), Nev. (Clark County), Utah (Washington County). Pollen: Collects pollen from the flowers of *Lepidium fremontii*.  
*Perdita fremonti* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 250, figs. 1011, 1012, 1149. ♀, ♂.
- Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 143 (tax. status, geogr. and floral records).
- tortifoliae tortifoliae* Cockerell. Colo. (Florissant and Wilkerson Pass), N. Mex. (Rio Arriba County). Pollen: Presumably collects pollen from the flowers of *Lepidium jonesii*, but also visits flowers of *Bigelovia tortifoliae*, *Eriogonum umbellatum*, *Ranunculus eremogenes*.  
*Perdita tortifoliae* Cockerell, 1906. Amer. Mus. Nat. Hist., Bul. 22: 440. ♀.
- Taxonomy: Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 132, 144, 245-247, figs. 45, 1005, 1006, 1146. ♀, ♂ (key, redescription, geogr. and floral records). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 143 (tax. status, geogr. and floral record).
- triangulifera* Timberlake. West. Tex. to south. Calif., deserts. Pollen: Apparently an oligolege of *Prosopis*, but visits other flowers presumably for nectar including *Acacia greggii*, *Cercidium floridum*, *Dithyrea wislizeni*, *Melilotus*, *Mimosa*, *Phoradendron*, *Tamarix*.  
*Perdita triangulifera* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 328, figs. 71, 1075-1076, 1181. ♀, ♂.
- trinitata* Timberlake. Tex. Pollen: Unknown, but visits flowers of *Lesquerella gordonii*, *Nama hispidum*, *Neorisya camporum*.  
*Perdita trinitata* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 249, figs. 47, 1009, 1010, 1148. ♂.
- Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 115, 116, 144-145, fig. 26. ♀, ♂ (key, redescription, geogr. and floral records).
- veris* Timberlake. Ariz. (Pima County). Pollen: Collects pollen from the flowers of *Nama hispidum*, but visits other flowers for nectar including *Teucrium cubense depressum*.  
*Perdita veris* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 137, figs. 21, 1289, 1290, 1348. ♀, ♂.
- vidua* Timberlake. Tex. (El Paso County). Pollen: Unknown, but visits flowers of *Gossypium*.  
*Perdita vidua* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 309. ♀.
- vittata conformis* Timberlake. Nev. (Lincoln County).  
*Perdita vittata conformis* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 284. ♀, ♂.



**vittata tricolor** Timberlake. South. Calif. (Mojave Desert and south. San Joaquin Valley).

Pollen: Unknown, but visits flowers of *Cleomella obtusifolia*, *Wislizenia refracta*. The typical subspecies, *Perdita vittata vittata* Cockerell, occurs in Mexico (Baja California).

*Perdita vittata tricolor* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 283. ♂, ♀.

**wernerii** Timberlake. Ariz. (Springerville).

*Perdita wernerii* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 154, figs. 1297, 1298, 1352. ♂.

**wilmattae miricornis** Cockerell. Wyo. (Green River), Colo. (Mesa and Moffat Counties), Utah (Carbon County), Ariz. (Grand Canyon). Pollen: Unknown, but visits flowers of *Cleome*, *Engelmannia pinnatifida*, *Phacelia*, *Stanleya pinnata*.

*Perdita miricornis* Cockerell, 1922. Amer. Mus. Novitates 33: 9. ♂, ♀.

*Perdita miricornis* var. *leucorhina* Cockerell, 1922. Amer. Mus. Novitates 33: 10. ♀.

Taxonomy: Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 310, 314, 360. ♂, ♀ (key, redescription, tax. status, geogr. and floral records). —Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 245 (tax. status). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 145 (key).

**wilmattae stanleyae** Timberlake. Utah (Grand, Uintah and Washington Counties), Nev., Calif. (Inyo County). Pollen: Unknown, but visits flowers of *Asclepias*, *Cleome lutea*, *Mentzelia*, *Prunus*, *Stanleya pinnata*, *Thelypodium laciniatum*.

*Perdita stanleyae* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 253, figs. 48, 1017, 1018, 1152. ♀, ♂.

Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 145 (key, tax. status, geogr. record).

**wilmattae wilmattae** Cockerell. Colo., Utah, Nev. (Humboldt County). Pollen: Unknown, but visits flowers of *Cleome lutea*, *Engelmannia*, *Phacelia alba*, *Stanleya pinnata*.

*Perdita wilmattae* Cockerell, 1906. Amer. Mus. Nat. Hist., Bul. 22: 441. ♂, ♀.

Taxonomy: Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 310, 314, 359-360, figs. 436, 437, 502. ♂, ♀ (key, redescription, tax. status, geogr. and floral records). —Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 137, 245 (key, floral records). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 145 (key).

**wislizeniae** Timberlake. N. Mex. (Luna County), Ariz. (Cochise County); Mexico (Chihuahua).

Pollen: Apparently an oligolege of *Wislizenia refracta*, but also visits flowers of *Cleome*, *Eriogonum thomasi*, *Lepidium*.

*Perdita wislizeniae* Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 284, figs. 57, 1049, 1050, 1168. ♀, ♂.

**zebrata flavens** Timberlake. Nev., Oreg., Idaho, Wyo., Utah, Colo., Calif. (Inyo County). Pollen:

Apparently collects pollen only from the flowers of *Cleome* including *C. lutea*, *C. serrulata*, but visits other flowers for nectar including *Engelmannia pinnatifida*, *Phacelia*, *Salsola kali*.

*Perdita zebrata flavens* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 357. ♀, ♂.

Taxonomy: Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 138, 153, 262 (key, geogr. and floral record).

**zebrata zebrata** Cresson. N. Dak., Nebr. and N. Mex., west to Idaho, Nev. and Ariz. Parasite:

*Neolarra pruinosa* Ashmead. Pollen: Collects pollen from the flowers of *Cleome* including *C. serrulata*, but visits other flowers presumably for nectar including *Haplopappus heterophyllus*, *Helianthus petiolaris*, *Nolina microcarpa*, *Solidago*.

*Perdita zebrata* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 69. ♀ (part).

*Perdita canina* Cockerell, 1895. Acad. Nat. Sci. Phila., Proc. 47: 17. ♂.

*Perdita bakerae* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 69. ♂, ♀.

Taxonomy: Cockerell, 1903. In Viereck, Amer. Ent. Soc., Trans. 29: 51. —Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 310, 313, 356-357, figs. 434, 435, 501 (key, tax. characters, tax. status, synonymy, geogr. and floral records). —Timberlake, 1964. Calif. Univ. Pubs. Ent. 28: 138, 153, 262 (key, geogr. range). —Rozen, 1966. Amer. Mus. Novitates 2259: 17-19, figs. 41-46 (larva). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 118, 150, figs. 1295, 1296, 1351. ♂ (key, variation, geogr. records).

Biology: Custer, 1929. Canad. Ent. 61: 49 (nesting habits with description of larva). —Rozen, 1967. Amer. Mus. Novitates 2297: 34-38, figs. 2, 4, 11, 14, tables 1-2 (nest architecture, life history, pollen source, parasite).

## SPECIES GROUP VALIDA

This species may be better placed in a new genus related to *Perdita*.

Taxonomy: Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 106 (tax. characters).

valida Timberlake. N. Mex. (Mesilla).

*Perdita valida* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 106. ♀.

## Genus PERDITA Subgenus PERDITELLA Cockerell

*Perdita* subg. *Perditella* Cockerell, 1899. Psyche 8: 312.

Type-species: *Perdita larreae* Cockerell. Orig. desig. (= *Perdita laneae* Cockerell).

Taxonomy: Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 348 (key). —Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 267-268 (redescription, key to included spp.).

*cladothricis* Cockerell. West. Tex., N. Mex., Ariz.; Mexico (Baja California, San Luis Potosi, Sonora and Zacatecas). Pollen: Possibly an oligolege of *Tidestromia* including *T. lanuginosa*, but visits other flowers presumably for nectar including *Gutierrezia microcephala*, *Haplopappus wrightii*, *Medicago sativa*, *Pectis papposa*.

*Perdita cladothricis* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 82. ♀, ♂.

Taxonomy: Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 268, 270, figs. 207, 208, 305 (male genitalia, geogr. and floral records). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 30 (geogr. records).

*larreae* Cockerell. N. Mex., Ariz., South. Calif.; Mexico (Baja California, Chihuahua and Coahuila). Pollen: Collects pollen from the flowers of *Larrea tridentata*, but visits these and other flowers for nectar including *Aplopappus heterophyllus*, *Asclepias*, *Baccharis glutinosa*, *Croton californicus*, *Dalea*, *Dicraurus*, *Eriogonum reniforme*, *Euphorbia polycarpa*, *Pectis papposa*, *Tamarix*.

*Perdita larreae* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 62. ♂.

*Perdita larreaeum* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 63. ♀.

*Perdita larreae* var. *modesta* Cockerell, 1897. Acad. Nat. Sci. Phila., Proc. 49: 355. ♂.

*Perdita laneae* Cockerell, 1899. Psyche 8: 312. Error for *larreae*.

Taxonomy: Timberlake, 1928. Amer. Mus. Novitates 321: 11. ♀. —Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 268, figs. 203, 204, 304 (tax. characters, synonymy, geogr. and floral records). —Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 134 (variation, geogr. and floral records).

Biology: Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 25-26, fig. 7 (floral relationships).

*marcialis* Cockerell. West. Tex. to south. Calif., Nev.; Mexico (Coahuila, Sonora). Pollen: Collects pollen from the flowers of *Larrea tridentata* and possibly also from other flowers including *Aloysia wrightii*, *Chrysothamnus paniculatus*, *Eriogonum fasciculatum* var. *polifolium*, *Phacelia*, *Salvia vaseyi*.

*Perdita marcialis* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 62. ♂.

*Perdita phaceliae* Cockerell, 1898. Ann. and Mag. Nat. Hist. (7) 2: 450. ♀.

Taxonomy: Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 268, 269-270, figs. 205, 206 (key, redescription, geogr. and floral records). —Timberlake, 1960. Calif. Univ. Pubs. Ent. 17: 134-135 (synonymy).

Biology: Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 26 (floral relationships).

*minima* Cockerell. Ariz., South. Calif.; Mexico (Baja California). Pollen: Collects pollen from the flowers of *Euphorbia* including *E. albomarginata*, *E. polycarpa*, *E. p.* var. *hirtella*, but visits these and other flowers for nectar including *Croton californicus*, *Eriogonum gracile*, *Gutierrezia*.

*Perdita minima* Cockerell, 1923. Amer. Mus. Novitates 66: 4. ♀.

Taxonomy: Cockerell, 1925. Pan-Pacific Ent. 1: 179. ♂. —Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 268, 270, figs. 209, 210 (key, redescription, geogr. and floral records).

Genus *PERDITA* Subgenus *PROCOCKERELLIA* Timberlake

*Perdita* subg. *Procockerellia* Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 402.

Type-species: *Perdita albonotata* Timberlake. Orig. desig.

Taxonomy: Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 5-7 (key to spp. of subgenera *Procockerellia*, *Allomacrotera*).

**albonotata** Timberlake. South. Calif. (Colorado and Mojave Deserts), Ariz. (Mohave County), Utah (Cache and Washington Counties); Mexico (Sonora). Pollen: Collects pollen from the flowers of *Stephanomeria* including *S. erigua*, *S. pauciflora*, but visits other flowers presumably for nectar including *Agave deserti*, *Chaenactis glabriuscula*, *Eriogonum plumatella*.

*Perdita albonotata* Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 403, figs. 91, 92, 161. ♀, ♂.

**brachyglossa** Timberlake. Ariz. (Coconino County). Pollen: Unknown, but visits flowers of *Thelesperma*.

*Perdita brachyglossa* Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 6. ♀.

**excellens** Timberlake. Utah (Grand and Washington Counties), Ariz. (Coconino County). Pollen: Unknown, but visits flowers of *Cleome lutea*.

*Perdita excellens* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 384. ♀.

Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 22. ♂.

**moabensis** Timberlake. Utah (Moab).

*Perdita moabensis* Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 7. ♀.

Genus *PERDITA* Subgenus *PSEUDOMACROTERA* Timberlake

*Perdita* subg. *Pseudomacrotera* Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 349.

Type-species: *Perdita turgiceps* Timberlake. Orig. desig.

**turgiceps** Timberlake. Calif. (Colorado and Mojave Deserts), Ariz., (Maricopa Mts.); Mexico (Baja California). Pollen: Apparently an oligoleg of *Larrea tridentata*, but visits a wide variety of other flowers for nectar including *Acacia greggii*, *Cercidium floridum*, *Cowania stansburiana*, *Cryptantha angustifolia*, *C. barbigera*, *Dalea californica*, *D. fremontii*, *D. schottii*, *Datura meteloides*, *Encelia farinosa*, *Eriodictyon crassifolium*, *Eriogonum inflatum*, *E. trichopes*, *Eschscholzia*, *Eucnide urens*, *Hyptis emoryi*, *Larrea tridentata*, *Lasthenia*, *Nama hispida*, *Prosopis juliflora*.

*Perdita turgiceps* Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 350, figs. 3, 4, 116, 117. ♂, ♀.

Biology: Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 26 (floral relationships).

Genus *PERDITA* Subgenus *PYGOPERDITA* Timberlake

*Perdita* subg. *Pygoperdita* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 275.

Type-species: *Perdita interrupta* Cresson. Orig. desig.

Although several of the species visit flowers of the Compositae, especially *Layia* and *Malacothrix*, most members of this subgenus visit flowers of other families, such as the Rosaceae, Papaveraceae, Rhamnaceae and Liliaceae.

Taxonomy: Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 275-284 (key to included spp.).

## SPECIES GROUP INTERRUPTA

**associata** Timberlake. Calif. (San Benito County).

*Perdita associata* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 32. ♀.

**aureovittata aureovittata** Cockerell. South. Calif. (cismontane, south of San Gabriel Mts.).

Pollen: Unknown, but visits flowers of *Layia*, *Malacothrix californica* var. *glabrata*.

*Perdita (Cockerellia) aureovittata* Cockerell, 1916. Canad. Ent. 48: 391. ♀.

Taxonomy: Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 391 (tax. status). —Timberlake, 1956.

Calif. Univ. Pubs. Ent. 11: 276, 281, 285, figs. 221, 222, 311, 337. ♀, ♂ (redescription, new status, geogr. and floral records). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 33 (geogr. range).

**aureovittata maderensis** Timberlake. Calif. (Madera County). Pollen: Unknown, but presumably visits flowers of *Malacothrix californica*.

*Perdita aureovittata maderensis* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 286. ♀, ♂.

Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 33 (geogr. range).

**aureovittata soluta** Timberlake. Calif. (South Coast and Peninsular Ranges). Pollen: Unknown, but visits flowers of *Agoseris aurantiaca*, *A. heterophylla*, *Encelia actoni*, *Linanthus aureus*, *Malacothrix californica*.

*Perdita soluta* Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 394, fig. 520. ♂.

Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 33 (tax. status, geogr. range).

**aureovittata stenozona** Timberlake. Calif. (San Benito and San Luis Obispo Counties). Pollen:

Unknown, but visits flowers of *Chaenactis glabriuscula*, *Malacothrix californica*.

*Perdita aureovittata stenozona* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 286. ♀, ♂.

**fieldi** Timberlake. South. Calif. (Monterey to San Diego County). Pollen: Unknown, but visits flowers of *Adenostoma fasciculatum*, *Calochortus splendens*, *Eriogonum fasciculatum*.

*Perdita fieldi* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 291, figs. 227, 228, 315, 340. ♀, ♂.

**inflexa** Timberlake. Calif. (Riverside County). Pollen: Unknown, but visits flowers of

*Eschscholzia multiflora* var. *darwinensis*.

*Perdita inflexa* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 298, figs. 237, 238, 345, 346. ♂.

**interrupta interrupta** Cresson. South. Calif. (cismontane). Pollen: Collects pollen from the flowers of *Eschscholzia californica*, but visits other flowers for nectar including *Baccharis emoryi*, *Coreopsis californica*, *Cryptantha intermedia*, *Lasthenia chrysostoma*, *Lepidospartum squamatum*, *Sisymbrium irio*, *Solidago occidentalis*, *Tamarix gallica*; also has been taken at the flowers of *Yucca*, but since these flowers are not attractive to bees, the plant in question was presumably *Nolina parryi*.

*Perdita interrupta* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 70. ♂.

Taxonomy: Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 277, 282, 292, figs. 229, 230, 316, 341. ♀, ♂ (redescription, tax. status, geogr. and floral records).

**interrupta kernensis** Timberlake. Calif. (Kern County). Pollen: Unknown, but visits flowers of *Cryptantha*.

*Perdita interrupta kernensis* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 293. ♀, ♂.

**interrupta vernalis** Timberlake. Calif. (San Diego County).

*Perdita interrupta vernalis* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 293. ♀, ♂.

**layiae excisa** Timberlake. South. Calif. (cismontane). Pollen: Unknown, but visits flowers of *Chaenactis glabriuscula*, *Layia platyglossa*.

*Perdita layiae excisa* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 288. ♀, ♂.

**layiae layiae** Cockerell. Calif. (San Miguel Island). Pollen: Unknown, but visits flowers of *Layia platyglossa*.

*Perdita layiae* Cockerell, 1938. Ann. and Mag. Nat. Hist. (11) 2: 152. ♀, ♂.

Taxonomy: Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 277, 281, 288, figs. 223, 224, 313, 338 (redescription).

**malacothricis** Timberlake. South. Calif. deserts, Nev. (Clark County), Ariz. (Tucson). Pollen:

Unknown, but visits flowers of *Aster*, *Baileya multiradiata*, *B. pleniradiata*, *Calycoseris parryi*, *Chaenactis fremontii*, *Hymenoclea salsola*, *Larrea tridentata*, *Malacothrix californica* var. *glabrata*, *Stephanomeria exigua*, *S. pauciflora*.

*Perdita malacothricis* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 289, figs. 225, 226, 314, 339. ♀, ♂.

Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 36 (geogr. and floral records).

**malacothricis var. unica** Timberlake. Calif. (Riverside County).

*Perdita malacothricis* var. *unica* Timberlake, 1962. Calif. Univ. Pubs. Ent. 28: 96. ♀.

**micheneri micheneri** Timberlake. South. Calif. (cismontane); Mexico (Baja California). Pollen: Unknown, but visits flowers of *Ceanothus cordulatus*, *C. greggii*, *C. leucodermis*, *C.*

*orcuttii*, *Cryptantha intermedia*, *C. micrantha*, *C. muricata*, *Eriophyllum confertiflorum*, *Eschscholzia californica*, *Rhamnus crocea*, *Rhus ovata*.

*Perdita micheneri micheneri* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 294, figs. 231, 232, 317, 342. ♀, ♂.

Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 36 (geogr. record).

**micheneri rhamnophila** Timberlake. Calif. (Rock Creek in San Gabriel Mts.). Pollen:

Unknown, but visits flowers of *Rhamnus crocea*.

*Perdita micheneri rhamnophila* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 295. ♂.

**mucronata** Timberlake. Calif. (Riverside County); desert. Pollen: Unknown, but visits flowers of *Camissonia brevipes*, *Eschscholzia minutiflora* var. *darwinensis*.

*Perdita mucronata* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 297, figs. 235, 236, 318, 344. ♂.

Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 36. ♀.

**nitens** Timberlake. Calif. (Mendocino, San Benito, Santa Barbara and Stanislaus Counties).

Pollen: Unknown, but visits flowers of *Eriogonum*, *Eschscholzia californica*, *Mimulus fremontii*, *Phacelia*.

*Perdita nitens* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 295, figs. 233, 234, 343. ♀, ♂.

**quadrisingnata** Timberlake. Calif. Pollen: Unknown, but visits flowers of *Baccharis*, *Ceanothus*, *Clarkia*, *Coreopsis bigelovii*, *Cryptantha muricata*, *Eriophyllum confertiflorum*, *Eschscholzia californica*, *Layia platyglossa*, *Plagiobothrys nothofulvus*, *Prunus subcordata*, *Rhamnus crocea*, *Salix*.

*Perdita quadrisingnata* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 296. ♀.

Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 39. ♂.

**transversa** Timberlake. Oreg. (Jackson County).

*Perdita transversa* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 287, figs. 312. ♂.

**vandykei** Timberlake. Calif. (Monterey County).

*Perdita vandykei* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 286. ♀, ♂.

#### SPECIES GROUP CALIFORNICA

Biology: Linsley, 1958. *Hilgardia* 27: 562, table 5 (oligolecty).

**argemones** Timberlake. Ariz. (Maricopa, Pima and Pinal Counties). Pollen: Unknown, but visits flowers of *Argemone*.

*Perdita argemones* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 309, figs. 261, 262, 327, 358. ♀, ♂.

**arizonica** Timberlake. Ariz. (Oak Creek Canyon). Pollen: Apparently collects pollen from the flowers of *Calochortus*.

*Perdita arizonica* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 310, figs. 263, 264, 328, 359. ♀, ♂.

**bilobata** Timberlake. Calif. (Inyo and San Bernardino Counties). Pollen: Unknown, but visits flowers of *Calochortus aureus*, *C. kennedyi*, *Haplopappus cooperi*.

*Perdita bilobata* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 305, figs. 253, 254, 354. ♀, ♂.

**bispinata** Timberlake. Calif. (San Bernardino and Riverside Counties). Pollen: Unknown, but visits flowers of *Calochortus kennedyi*, *Haplopappus cooperi*.

*Perdita bispinata* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 303, figs. 249, 250, 323, 352. ♀, ♂.

**bohartorum** Timberlake. Calif. (Mono County).

*Perdita bohartorum* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 319, figs. 275, 276, 365. ♀, ♂.

**californica californica** (Cresson). Coastal Calif. (Mt. Diablo, southward); Mexico (Baja California). Pollen: Apparently collects pollen from the flowers of *Calochortus* including *C. concolor*, *C. kennedyi*, *C. luteus*, *C. plummerae*, *C. splendens*, *C. venustus*, *C. weedii*, but visits other flowers for nectar including *Cryptantha*, *Eriogonum fasciculatum*, *Eriophyllum confertiflorum*, *Grindelia*, *Opuntia*.

*Macrotera californica* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 71. ♂.

- Taxonomy: Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 280, 282, 301-302. ♀. —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 34 (tax. status, geogr. range).
- californica inopina** Timberlake. Calif. (Inyo County).  
*Perdita californica inopina* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 33. ♀.
- calochorti** Timberlake. Calif. (San Bernardino and Inyo Counties). Pollen: Unknown, but visits flowers of *Calochortus nuttallii*.  
*Perdita calochorti* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 299, figs. 239, 240, 320, 347. ♀, ♂.
- coalingensis** Timberlake. Calif. (Coalinga). Pollen: Unknown, but visits flowers of *Eschscholzia californica*.  
*Perdita coalingensis* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 313. ♀.
- cowaniae** Timberlake. Calif. (Inyo County). Pollen: Unknown, but visits flowers of *Calochortus kennedyi* var. *munzii*, *Cowania stansburiana*.  
*Perdita cowaniae* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 315, figs. 269, 270, 331, 362. ♀, ♂.
- digressa** Timberlake. Ariz. (Tucson), Calif. (Granite Mts., San Bernardino County). Pollen: Unknown, but visits flowers of *Baileya multiradiata*, *Chaenactis*.  
*Perdita digressa* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 34, figs. 1211, 1212, 1309, 1354. ♂, ♀.
- distropica** Timberlake. Calif. (South Coast Ranges). Pollen: Collects pollen from the flowers of *Calochortus* including *C. clavatus*, *C. luteus*, *C. splendens*, *C. venustus* and *Eschscholzia californica*, but visits other flowers for nectar including *Adenostoma*, *Eriogonum*.  
*Perdita distropica* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 312, figs. 265, 266, 329, 360. ♀, ♂.
- duplonotata** Timberlake. Utah (Garfield County), Nev. (Charleston Mts.), Calif. (San Bernardino County). Pollen: Unknown, but visits flowers of *Fallugia paradoxa*, *Isomeris arborea*.  
*Perdita duplonotata* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 307, figs. 257, 258, 356. ♀, ♂.
- erigoni** Cockerell. Colo. Pollen: Unknown, but visits flowers of *Eriogonum umbellatum*.  
*Perdita erigoni* Cockerell, 1925. Ann. and Mag. Nat. Hist. (9) 16: 621. ♀, ♂.
- Taxonomy: Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 279, 284, 322-323, figs. 279, 280, 367 (tax. characters). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 35-36. ♂ (color variation).
- fallugiae** Timberlake. Nev. (Charleston Mts.). Pollen: Unknown, but visits flowers of *Calochortus flexuosus*, *Fallugia paradoxa*, *Hymenoxys cooperi*.  
*Perdita fallugiae* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 314, figs. 267, 268, 330, 361. ♀, ♂.
- leucostoma** Timberlake. Calif. (Kern and Inyo Counties). Pollen: Unknown, but visits flowers of *Calochortus leichtlinii*, *Haplopappus linearifolius*.  
*Perdita leucostoma* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 300, figs. 241, 242, 321, 348. ♀, ♂.
- macrostoma** Cockerell. Calif. Pollen: Apparently collects pollen from the flowers of *Calochortus*.  
*Perdita macrostoma* Cockerell, 1922. U. S. Natl. Mus., Proc. 60 (18): 18. ♂, ♀.
- Taxonomy: Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 278, 283, 304, figs. 251, 252, 324, 353 (tax. characters).
- mohavensis mohavensis** Timberlake. South. Calif. deserts. Pollen: Probably collects pollen mainly from the flowers of *Eschscholzia*, but visits flowers of *Amsinckia intermedia*, *Argemone platyceras*, *Calochortus aureus*, *Calycoseris wrightii*, *Chaenactis stevioides* var. *brachypappa*, *Encelia farinosa*, *Eschscholzia californica*, *E. glyptosperma*, *E. minutiflora* var. *darwiniensis*, *E. parishii*, *Haplopappus cooperi*, *Hyptis emoryi*, *Larrea tridentata*, *Monardella exilis*, *Salix*, *Salvia*.  
*Perdita mohavensis* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 306, figs. 255, 256, 325, 355. ♀, ♂.

**mohavensis pimana** Timberlake. Ariz. (Pima County). Pollen: Unknown, but visits flowers of *Baileya*.

*Perdita mohavensis pimana* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 36. ♀.

**montereyensis** Timberlake. Calif. (Monterey, San Benito and San Luis Obispo Counties).

Pollen: Collects pollen from the flowers of *Calochortus splendens*, *C. venustus* and *Eschscholzia californica*, but visits other flowers for nectar including *Eriogonum*, *Rhamnus crocea*.

*Perdita montereyensis* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 302, figs. 245, 246, 350. ♀, ♂.

Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 36 (color variation, geogr. and floral record).

**mormonica** Timberlake. Utah (Garfield and Tooele Counties). Pollen: Unknown, but visits flowers of *Sphaeralcea*.

*Perdita mormonica* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 311. ♀.

Taxonomy: Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 10 (color variation).

**nebrascensis** Swenk and Cockerell. Nebr., (Neligh, Antelope County). Pollen: Unknown, but visits flowers of *Helianthus*.

*Perdita nebrascensis* Swenk and Cockerell, 1907. Ent. News 18: 53. ♀, ♂.

Taxonomy: Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 395-396 (key, tax. status).

**nevadensis culbertsoni** Timberlake. Calif. (Tulare, Santa Cruz Counties, Yosemite Natl. Pk.).

*Perdita nevadensis culbertsoni* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 318. ♀, ♂.

**nevadensis molina** Timberlake. Calif. (San Bernardino Mts.).

*Perdita nevadensis molina* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 318, figs. 273, 274, 364. ♀, ♂.

Taxonomy: Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 396 (key).

**nevadensis nevadensis** Cockerell. B. C. to north. Calif. Pollen: Unknown, but visits flowers of *Eriogonum*.

*Perdita nevadensis* Cockerell, 1896. Acad. Nat. Sci. Phila., Proc. 48: 58. ♀.

*Perdita nigricollis* Timberlake, 1929. Pan-Pacific Ent. 6: 54. ♀.

Taxonomy: Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 279, 284, 316-318, figs. 271, 272, 332, 363. ♀, ♂ (redescription, synonymy).

**obtusa** Timberlake. Calif. (Tulare County).

*Perdita obtusa* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 37. ♀.

**pulliventris** Timberlake. Calif. (Tuolumne County).

*Perdita pulliventris* Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 38. ♀.

**robustula** Timberlake. South. Calif. Pollen: Unknown, but visits flowers of *Acacia greggii*,

*Agave deserti*, *Argemone corymbosa*, *A. platyceras*, *Cryptantha utahensis*, *Encelia farinosa*, *Eriogonum inflatum*, *Eschscholzia minutiflora* var. *darwinensis*, *Prosopis juliflora*, *Stanleya pinnata*.

*Perdita robustula* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 308, figs. 259, 260, 326, 357. ♀, ♂.

**santaclarensis** Timberlake. Calif. (Santa Clara County).

*Perdita santaclarensis* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 314. ♀.

**tularensis** Timberlake. Calif. (Alpine, Tuolumne, and Mariposa Counties, south to Tehachapi Pass). Pollen: Unknown, but visits flowers of *Calochortus luteus*, *C. venustus*.

*Perdita tularensis* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 303, figs. 247, 248, 351. ♀, ♂.

**wyomingensis sculleni** Timberlake. Oreg., Wash.

*Perdita sculleni sculleni* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 320, figs. 277, 278, 333, 366. ♀, ♂.

Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 40 (tax. status, key).

**wyomingensis segona** Timberlake. Utah, Wyo., Nev. Pollen: Unknown, but visits flowers of *Calochortus nuttallii*.

*Perdita sculleni segona* Timberlake, 1956. Calif. Univ. Pubs. Ent. 11: 322. ♀, ♂.

- Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 40 (tax. status, key).  
*wyomingensis wyomingensis* Cockerell. Wyo. (Teton County). Predator: *Phylanthus pulcher* Dalla Torre.  
*Perdita wyomingensis* Cockerell, 1922. Amer. Mus. Novitates 33: 13. ♀.  
 Taxonomy: Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 40 (type, tax. status, key).

#### Genus PERDITA Subgenus XEROMACROTERA Timberlake

- Perdita* subg. *Xeromacrotera* Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 412.  
 Type-species: *Macrotera cephalotes* Cresson. Orig. desig.  
 Taxonomy: Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 347 (key).  
*cephalotes* (Cresson). Nev., Calif. (Kern and San Bernardino Counties), Ariz. (Coconino County). Pollen: Unknown, but visits flowers of *Chrysothamnus*, *Gutierrezia lucida*.  
*Macrotera cephalotes* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 71. ♂.  
 Taxonomy: Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 413, figs. 109, 110, 170 (male genitalia, geogr. and floral records). —Timberlake, 1968. Calif. Univ. Pubs. Ent. 49: 22 (geogr. and floral record). —Timberlake, 1971. Calif. Univ. Pubs. Ent. 66: 7 (geogr. and floral record).

#### Genus PERDITA Subgenus XEROPHASMA Cockerell

- Xerophasma* Cockerell, 1923. Amer. Mus. Novitates 66: 1.  
 Type-species: *Perdita bequaertiana* Cockerell. Monotypic and orig. desig.  
 (= *Xerophasma bequaerti* Cockerell).  
 These species are apparently crepuscular and obtain pollen only from the flowers of *Oenothera*.  
 Taxonomy: Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 346, 348-349 (redescription, key to included spp.).  
*bequaertiana* Cockerell. Tex. (El Paso and Howard Counties), N. Mex. (Albuquerque). Pollen: Collects pollen from the flowers of *Oenothera*.  
*Xerophasma bequaerti* Cockerell, 1923. Amer. Mus. Novitates 66: 2. ♀. Preocc.  
*Perdita bequaertiana* Cockerell, 1951. In Michener, *In* Muesebeck, Krombein and Townes, U. S. Dept. Agr., Agr. Monog. 2: 1089. N. name.  
 Taxonomy: Timberlake, 1953. Kans. Univ. Sci. Bul. 35: 962-963. ♂. —Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 349, figs. 1, 2, 115 (key). —Timberlake, 1958. Calif. Univ. Pubs. Ent. 14: 375 (geogr. record).  
*pallida* Timberlake. Calif. (Colorado Desert), Ariz. (Yuma). Ecology: Attracted to artificial lights near dusk through early evening. This species was readily observed in flight at Borrego and Hopkins Well on the Colorado Desert by shining automobile headlights on the patches of *Oenothera* being visited by this species. Commencing about nightfall many males and some females were attracted to the lights of gasoline lanterns. Activity at the flowers continued well into the darkness of early evening. These observations were made in sand dune areas and suggest the possibility that this species may be arenophilous in its choice of nesting sites. Pollen: Collects pollen from the flowers of *Oenothera deltoides*, *O. trichocalyx*, but visits these and other flowers for nectar including *Trichostema*.  
*Perdita pallida* Timberlake, 1954. Calif. Univ. Pubs. Ent. 9: 349. ♀, ♂.

#### NOMEN NUDUM IN PERDITA

- Perdita excisa* Timberlake, 1928. Amer. Mus. Novitates 321: 10.

### Family HALICTIDAE

This is among the largest and most widely distributed families of bees. All three of its sub-families occur in the Nearctic Region, but only the Dufoureae and the Halictinae are well represented by numerous species.



Revision: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 515-521, figs. (spp. of eastern U. S.).

Biology: Sakagami and Michener, 1962. The Nest Architecture of the Sweat Bees. Kansas Univ. Press, 135 pp., 181 figs. — Torchio, Rozen, Bohart and Favreau, 1967. N. Y. Ent. Soc., Jour. 75: 145-146, table 1 (biological differences among subfamilies).

#### SUBFAMILY DUFOUREINAE

Although this subfamily is chiefly Holarctic in distribution, it is also represented in the Ethiopian, Oriental and Neotropical regions by at least one or more species. It is absent in the Australian Region. Many, if not most of the species, are apparently highly restricted in their intrafloral relationships and thus oligolecty is a relatively common phenomenon of this subfamily.

Taxonomy: Michener, 1965. Ent. Soc. Amer., Ann. 58: 321-326, 28 figs. (generic review).

#### Genus DUFOUREA Lepeletier

Taxonomy: Bohart, 1947. Ent. Soc. Amer., Ann. 40: 692-704. — Bohart, 1948. Ent. Soc. Amer., Ann. 41: 119-136. — Bohart, 1949. Ent. Soc. Amer., Ann. 42: 55-62.

#### Genus DUFOUREA Subgenus DUFOUREA Lepeletier

*Dufourea* Lepeletier, 1841. Hist. Nat. Ins., Hym., v. 2, p. 227.

Type-species: *Dufourea minuta* Lepeletier. Desig. by Richards, 1935.

**convergens** Bohart. Calif. (San Diego Co.).

*Dufourea convergens* Bohart, 1949. Ent. Soc. Amer., Ann. 42: 59. ♂.

**leachi** Timberlake. Calif. (Humboldt and Mendocino Cos.). Pollen: Unknown, but visits flowers of *Brodiaea*.

*Dufourea leachi* Timberlake, 1939. Ent. Soc. Amer., Ann. 32: 398. ♂.

**viridis** Timberlake. South. Calif. Pollen: Unknown, but visits flowers of *Eschscholzia californica*, *Platystemon californicus*.

*Dufourea (Dufourea) viridis* Timberlake, 1941. Ent. Soc. Amer., Ann. 34: 39. ♂, ♀.

#### Genus DUFOUREA Subgenus HALICTOIDES Nylander

*Halictoides* Nylander, 1848. Notiser Sällskapet Faune Flora Fenn., v. 1, p. 195.

Type-species: *Halictoides dentiventris* Nylander. Desig. by Cockerell and Porter, 1899.

*Halictoides* subg. *Epihalictoides* Cockerell and Porter, 1899. Ann. and Mag. Nat. Hist. (7) 4: 420.

Type-species: *Panurgus marginatus* Cresson. Monotypic.

*Halictoides* subg. *Parahalictoides* Cockerell and Porter, 1899. Ann. and Mag. Nat. Hist. (7) 4: 420.

Type-species: *Halictoides campanulae* Cockerell. Orig. desig.

*Conohalictoides* Viereck, 1904. Ent. News 15: 245.

Type-species: *Panurgus novaengliae* Robertson. Monotypic and orig. desig. (= *Conohalictoides lovelli* Viereck).

*Neohalictoides* Viereck, 1904. Ent. News 15: 261.

Type-species: *Panurgus maurus* Cresson. Monotypic and orig. desig.

*Cryptohalictoides* Viereck, 1904. Ent. News 15: 261.

Type-species: *Cryptohalictoides spiniferus* Viereck. Monotypic and orig. desig.

*Mimulapis* Bridwell, 1919. Hawaii. Ent. Soc., Proc. 4: 162.

Type-species: *Mimulapis versatilis* Bridwell. Monotypic and orig. desig.

*Betheliella* Cockerell, 1924. Ent. News 35: 169.

Type-species: *Betheliella calochorti* Cockerell. Monotypic.

*Halictoides* subg. *Cephalictoides* Cockerell, 1924. Psyche 31: 244.

Type-species: *Halictoides paradoxus* Morawitz. Monotypic and orig. desig.

**afasciata** Bohart. Oreg., Calif. Pollen: Unknown, but visits flowers of *Trifolium*.

*Dufourea afasciata* Bohart, 1948. Ent. Soc. Amer., Ann. 41: 130. ♂, ♀.

- australis australis** (Michener). South. Calif. Pollen: Unknown, but visits flowers of *Chaenactis*, *Encelia farinosa*, *Erigeron foliosus*, *Eriophyllum*, *Lasthenia gracilis*. A third subspecies occurs in Baja California.  
*Halictoides australis* Michener, 1937. Ann. and Mag. Nat. Hist. (10) 19: 398. ♂.
- australis dammersi** Timberlake. South. Calif. (deserts).  
*Dufourea (Halictoides) dammersi* Timberlake, 1939. Ent. Soc. Amer., Ann. 32: 407. ♂.
- bernardina** (Michener). Calif. Pollen: Unknown, but visits flowers of *Agoseris aurantiaca*, *Erodium*, *Gilia capitata*, *Nemophila integrifolia*, *Lasthenia chrysostoma*, *Phacelia douglasii*.  
*Halictoides bernardina* Michener, 1937. Ann. and Mag. Nat. Hist. (10) 19: 401. ♂, ♀.
- boregoensis** (Michener). Ariz., Calif. Pollen: Collects pollen from flowers of *Camissonia* including *C. campestris*, *C. clavaeformis*, *C. pallida hallii*, *C. refracta*, *C. scapoidea*, but also visits flowers of *Abronia villosa*, *Cryptantha barbigera*, *C. dumetorum*, *Larrea tridentata*, *Malacothrix californica*, *Malva pusilla*, *Nama demissum*, *Phacelia fremontii*.  
*Halictoides boregoensis* Michener, 1937. Ann. and Mag. Nat. Hist. (10) 19: 398. ♂.
- Biology: Linsley, MacSwain and Raven, 1963. Calif. Univ. Pubs. Ent. 33: 19 (floral relationships). — Linsley, MacSwain and Raven, 1964. Calif. Univ. Pubs. Ent. 33: 76 (floral relationships). — Linsley, MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 71: 41 (floral relationships).
- brevicornis** Timberlake. Calif. Pollen: Unknown, but visits flowers of *Cryptantha intermedia*, *Linnanthus dianthiflorus*, *Sphaenosciadium capitellatum*.  
*Dufourea (Halictoides) brevicornis* Timberlake, 1939. Ent. Soc. Amer., Ann. 32: 403. ♂, ♀.
- calientensis** Timberlake. Calif. Pollen: Unknown, but visits flowers of *Coreopsis bigelovii*, *Eschscholzia californica*, *Gilia tricolor*, *Nemophila*, *Oenothera*, *Plagiobothrys nothofulvus*, *Prunus subcordata*.  
*Dufourea (Halictoides) calientensis* Timberlake, 1939. Ent. Soc. Amer., Ann. 32: 405. ♂, ♀.
- californica** (Michener). Calif. Pollen: Unknown, but visits flowers of *Lasthenia*.  
*Halictoides californicus* Michener, 1935. Pan-Pacific Ent. 11: 181. ♂.
- calochorti calochorti** (Cockerell). Calif. Pollen: Possibly an oligolege of *Calochortus*, visits flowers of *C. caeruleus* var. *maueanus*.  
*Betheliella calochorti* Cockerell, 1924. Ent. News 35: 170. ♂.
- calochorti sculleni** (Cockerell). Oreg. Pollen: Possibly an oligolege of *Calochortus*.  
*Betheliella calochorti sculleni* Cockerell, 1937. Canad. Ent. 69: 33. ♂.
- campanulae** (Cockerell). Wash. Pollen: Unknown, but visits flowers of *Calochortus*, *Campanula*.  
*Halictoides campanulae* Cockerell, 1897. Canad. Ent. 29: 289. ♂.
- crassipes** (Cockerell). Oreg.  
*Halictoides crassipes* Cockerell, 1924. Psyche 31: 243. ♂.
- cuprea** Bohart. Calif. Pollen: Unknown, but visits flowers of *Gilia*, *Nemophila*, *Phacelia*.  
*Dufourea cuprea* Bohart, 1948. Ent. Soc. Amer., Ann. 41: 119. ♂, ♀.
- davidsoni** (Cockerell). Calif. Pollen: Unknown, but visits flowers of *Eriogonum nudum*, *Gayophytum nuttallii*, *G. ramosissimum*.  
*Halictoides davidsoni* Cockerell, 1902. South. Calif. Acad. Sci., Bul. 1: 140. ♂.
- Taxonomy: Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 199. ♂, ♀.
- dentipes** Bohart. Calif. Parasite: *Neopasites fulviventris* (Cress.)? Pollen: Unknown, but apparently oligolege of *Calochortus albus*, *C. monophyllus*; also visits *Clarkia rhomboidea*, *Hypochoeris glabra*, *Wyethia angustifolia*.  
*Dufourea dentipes* Bohart, 1948. Ent. Soc. Amer., Ann. 41: 132. ♂, ♀.
- Biology: Torchio, Rozen, Bohart and Favreau, 1967. N. Y. Ent. Soc., Jour. 75: 144 (parasite).
- desertorum** Timberlake. South. Calif. (deserts). Pollen: Unknown, but visits flowers of *Eschscholzia* including *E. minutiflora* var. *darwinensis*.  
*Dufourea (Halictoides) desertorum* Timberlake, 1939. Ent. Soc. Amer., Ann. 32: 408. ♂, ♀.
- dilatipes** Bohart. Alta., Mont.  
*Dufourea dilatipes* Bohart, 1948. Ent. Soc. Amer., Ann. 41: 135. ♂, ♀.

- echinocaeti** Timberlake. South. Calif. (deserts). Pollen: Apparently an oligolege of *Echinocactus* including *E. acanthodes*, *E. cylindraceus*.  
*Dufourea (Halictoides) echinocaeti* Timberlake, 1939. Ent. Soc. Amer., Ann. 32: 399. ♂, ♀.
- fallugiae** (Cockerell). N. Mex. Pollen: Possibly an oligolege of *Fallugia*.  
*Halictoides fallugiae* Cockerell, 1906. Ann. and Mag. Nat. Hist. (7) 17: 359. ♀.
- femorata** Bohart. Calif. Pollen: Presumably oligolege of *Gilia* including *G. capitata*, *G. tricolor*, but also visits flowers of *Collinsia*, *Cryptantha*, *Layia glandulosa*, *Nemophila*, *Salvia*.  
*Dufourea femorata* Bohart, 1947. Ent. Soc. Amer., Ann. 40: 701. ♂, ♀.
- fimbriata fimbriata** (Cresson). Colo., N. Mex., Ariz., Calif. (high mountains). Pollen: Apparently an oligolege of *Potentilla* including *P. glandulosa*, but also visits flowers of *Penstemon*.  
*Panurgus fimbriatus* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 63. ♀.  
*Halictoides Harveyi* Cockerell, 1906. Ann. and Mag. Nat. Hist. (7) 17: 223. ♀.
- fimbriata sierrae** (Michener). Calif. (Sierra Nevada and White Mts.). Pollen: Unknown, but visits flowers of *Ranunculus*.  
*Halictoides harveyi sierrae* Michener, 1937. Ann. and Mag. Nat. Hist. (10) 19: 397. ♀.
- gilia** Bohart. Calif. (16 mi. E. Mt. Hamilton). Pollen: Unknown, but visits flowers of *Gilia*.  
*Dufourea gilia* Bohart, 1947. Ent. Soc. Amer., Ann. 40: 692. ♂, ♀.
- holocyanea** (Cockerell). Oreg., Calif. Pollen: Unknown, but visits flowers of *Ceanothus*, *Symphoricarpos*.  
*Halictoides holocyaneus* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 199. ♂.
- impunctata** Bohart. Calif. ("So. Cal.").  
*Dufourea impunctata* Bohart, 1949. Ent. Soc. Amer., Ann. 42: 58. ♂.
- latifrons** Timberlake. South. Calif. (deserts). Pollen: Collects pollen from flowers of *Camissonia* including *C. brevipes*, *C. clavaeformis*.  
*Dufourea (Halictoides) latifrons* Timberlake, 1939. Ent. Soc. Amer., Ann. 32: 409. ♂.
- Biology: Linsley, MacSwain and Raven, 1963. Calif. Univ. Pubs. Ent. 33: 19 (floral relationships).
- linanthi** Timberlake. South. Calif. Pollen: Apparently an oligolege of *Linanthus* including *L. aureus*, *L. dianthiflorus*, *L. lemmonii*, but also visits flowers of *Malacothrix glabrata*.  
*Dufourea (Halictoides) linanthi* Timberlake, 1939. Ent. Soc. Amer., Ann. 32: 402. ♂, ♀.
- longiceps** Bohart. Calif. (Panamint Mts.). Pollen: Unknown, but visits flowers of *Phacelia*.  
*Dufourea longiceps* Bohart, 1948. Ent. Soc. Amer., Ann. 41: 128. ♂, ♀.
- macswaini** Bohart. Calif. Pollen: Unknown, but visits flowers of *Clarkia cylindrica*, *C. dudleyana*, *C. purpurea*.  
*Dufourea macswaini* Bohart, 1969. Pan-Pacific Ent. 45: 57. ♂, ♀.
- Biology: MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 70: 49 (floral relationships).
- malacothricis** Timberlake. N. Mex., Ariz. and Calif. (deserts). Pollen: Presumably an oligolege of *Malacothrix* including *M. californica*, *M. glabrata*, but also visits flowers of *Anisocoma acaulis*, *Camissonia pallida hallii*, *Cryptantha barbiger*, *Eschscholzia minutiflora* var. *darwinensis*, *Phacelia fremontii*.  
*Dufourea (Halictoides) malacothricis* Timberlake, 1939. Ent. Soc. Amer., Ann. 32: 406. ♂, ♀.
- Biology: Torchio, Rozen, Bohart and Favreau, 1967. N. Y. Ent. Soc., Jour. 75: 141-142 (nest architecture, provisioning, development).
- marginata halictella** Michener. Wyo., Utah, Colo., N. Mex. Pollen: Unknown, but visits flowers of the Compositae including *Helianthus*.  
*Panurgus halictulus* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 63. ♂. Preocc.  
*Dufourea (Halictoides) marginata halictella* Michener, 1951. In Muesebeck, Krombein, Townes, U. S. Dept. Agr., Agr. Monog. 2: 1132. N. name.
- Taxonomy: Cockerell, 1922. Amer. Mus. Novitates 40: 3.

- marginata marginata** (Cresson). Minn., Wis. and Ill. to Miss., west to Alta., Colo. and Utah. Pollen: Collects pollen from flowers of *Helianthus annuus*, but also visits flowers of *Bidens aristosa*, *Erigeron macranthus*.  
*Panurgus marginatus* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 62. ♀.  
*Panurgus autumnalis* Robertson, 1895. Amer. Ent. Soc., Trans. 22: 121. ♀.  
 Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 516-518, figs.  
 Biology: Stephen, Bohart and Torchio, 1969. The biology and external morphology of bees, p. 122 (floral relationships).
- maura** (Cresson). N. Dak., Wyo., Idaho, Nebr., Colo., N. Mex. Pollen: Unknown, but visits flowers of *Campanula*. Predator: *Philanthus pulcher* Dalla Torre.  
*Panurgus maurus* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 61. "♀" = ♂.  
**monardae** (Viereck). Wis., Mich., Ill. and Tenn. Pollen: Oligolege of labiates, collects pollen from flowers of *Agastache foeniculum*, *Monarda* including *M. fistulosa*.  
*Conohalictoides monardae* Viereck, 1924. Ent. Soc. Wash., Proc. 26: 14. ♂, ♀.  
 Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 518-519, figs.  
 Biology: Bouseman, 1976. Kansas Ent. Soc., Jour. 49: 531-532 (floral relationships).
- mulleri** (Cockerell). Wyo., Calif., Ariz. Parasite: *Eurystyllops* sp., *Neoposites cressoni* Cwfd. Pollen: Oligolege of *Phacelia* including *P. affinis*, *P. distans*, *P. popei* var. *arizonica*, *P. ramosissima*, *P. tanacetifolia*, but also visits flowers of *Camissonia brevipes*, *Cryptantha* including *C. intermedia*, *Nemophila*.  
*Halictoides mulleri* Cockerell, 1898. Amer. Ent. Soc., Trans. 25: 190. ♀.  
 Taxonomy: Cockerell, 1910. Ann. and Mag. Nat. Hist. (8) 5: 24. ♂. —Michener, 1937. Ann. and Mag. Nat. Hist. (10) 19: 400. ♀, ♂.  
 Biology: Torchio, Rozen, Bohart and Favreau, 1967. N. Y. Ent. Soc., Jour. 75: 132-138, figs. 1-6 (nest architecture, provisioning and development, adult activity, pollen source, parasites).
- nemophilae** (Michener). Calif. Pollen: Presumably an oligolege of *Phacelia* including *P. davidsonii*, but also visits flowers of *Montia perfoliata*, *Nemophila integrifolia*.  
*Halictoides nemophilae* Michener, 1937. Ann. and Mag. Nat. Hist. (10) 19: 400. ♂, ♀.
- neocalifornica** Bohart. Calif.  
*Dufourea neocalifornica* Bohart, 1947. Ent. Soc. Amer., Ann. 40: 697. ♂.
- novaeangliae** (Robertson). Mo. and Mich. east to N. J. and Maine. Pollen: Unknown, but visits flowers of *Fagopyrum* and *Pontederia*.  
*Panurgus novae-angliae* Robertson, 1897. Acad. Sci. St. Louis, Trans. 7: 339. ♂.  
*Conohalictoides lovelli* Viereck, 1904. Ent. News 15: 245. ♀, ♂.  
 Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 519-520, figs. (redescription).
- nudicornis** Timberlake. South. Calif. (deserts). Pollen: Presumably an oligolege of Onagraceae including *Camissonia clavaeformis*, *C. c. aurantiaca*, *C. piersonii*, *Oenothera deltoidea*, but also visits flowers of *Eschscholzia*, *Phacelia crenulata*.  
*Dufourea (Halictoides) nudicornis* Timberlake, 1939. Ent. Soc. Amer., Ann. 32: 412. ♀, ♂.  
 Biology: Linsley, MacSwain and Raven, 1963. Calif. Univ. Pubs. Ent. 33: 19 (floral relationships).
- oenotherae** Timberlake. South. Calif. Pollen: Unknown, but visits flowers of *Camissonia bistorta*.  
*Dufourea (Halictoides) oenotherae* Timberlake, 1939. Ent. Soc. Amer., Ann. 32: 413. ♂.
- oryx** (Viereck). B. C., Colo., Ariz., N. Mex.  
*Halictoides (Parahalictoides) oryx* Viereck, 1903. Amer. Ent. Soc., Trans. 29: 48. ♂.  
 Taxonomy: Cockerell, 1916. Ent. News 27: 62. ♀.
- pectinipes** Bohart. Calif. Pollen: Unknown, but visits flowers of *Gilia*, *Mimulus* including *M. layneae*.  
*Dufourea pectinipes* Bohart, 1948. Ent. Soc. Amer., Ann. 41: 126. ♂, ♀.

- pulchricornis** (Cockerell). N. Mex., Ariz. Pollen: Oligolege of *Lesquerella*, including *L. gordonii*.  
*Halictoides pulchricornis* Cockerell, 1916. Ent. News 27: 63. ♂, ♀.
- Biology: Torchio, Rozen, Bohart and Favreau, 1967. N. Y. Ent. Soc., Jour. 75: 142-143 (nest architecture, provisioning, development, adult activity).
- rhamni** (Michener). South. Calif. Pollen: Unknown, but visits flowers of *Camissonia bistorta*, *Cryptantha intermedia*, *Dendromecon rigida*, *Eschscholzia californica*, *Rhamnus*, *Plagiobothrys*.  
*Halictoides rhamni* Michener, 1937. Ann. and Mag. Nat. Hist. (10) 19: 394. ♂, ♀.
- sandhouseae arida** Bohart. South. Calif. Pollen: Unknown, but visits flowers of *Phacelia*.  
*Dufourea sandhouseae arida* Bohart, 1949. Ent. Soc. Amer., Ann. 42: 61. ♂, ♀.
- sandhouseae sandhouseae** (Michener). Calif.; Mexico (Baja California). Pollen: Unknown, but visits a wide variety of flowers including *Arenaria douglasii*, *Agoseris heterophylla*, *Calandrinia menziesii*, *Camissonia bistorta*, *C. cheiranthifolia*, *C. claraeformis aurantiaca*, *C. parishii*, *Chaenactis*, *Coreopsis californica*, *Cryptantha intermedia*, *Convolvulus occidentalis*, *Dendromecon rigida*, *Encelia farinosa*, *Erodium botrys*, *Eschscholzia californica*, *Gilia multicaulis*, *G. tricolor*, *Hesperochiron californicus*, *Lasthenia chrysostoma*, *Layia elegans*, *L. platyglossa*, *Lessingia*, *Linanthus aureus*, *Lotium*, *Malacothrix californica*, *Nemophila menziesii*, *Phacelia*, *Prunus andersonii*, *Salvia columbariae*, *Sisymbrium irio*, *Stenotopsis linearifolius*.  
*Halictoides sandhouseae* Michener, 1937. Ann. and Mag. Nat. Hist. (10) 19: 328. ♂, ♀.
- saundersi** (Cockerell). Calif. (Central Valley). Pollen: Unknown, but visits flowers of *Camissonia campestris*.  
*Halictoides saundersi* Cockerell, 1898. Amer. Ent. Soc., Trans. 25: 189. ♀, ♂.
- scabricornis** Bohart. Calif., Oreg., Utah. Pollen: Unknown, but visits flowers of *Gayophytum*, *Symphoricarpos*. Predator: *Philanthus pacificus arizonae* Dunning, *P. pulcher* Dalla Torre.  
*Dufourea scabricornis* Bohart, 1949. Ent. Soc. Amer., Ann. 42: 57. ♂, ♀.
- scintilla** (Cockerell). South. Calif. Pollen: Presumably an oligolege of *Camissonia* including *C. bistorta*, *C. campestris*, *C. cheiranthifolia*, *C. contorta*, *C. dentata*, *C. micrantha*, *C. pallida hallii*, *C. sierrae*, *C. veitchiana*, but also visits flowers of *Clarkia*, *Cryptantha intermedia*, *C. muricata*, *Coreopsis californica*, *Eschscholzia californica*, *Euphorbia albomarginata*, *Phacelia douglasii*, *Plagiobothrys*, *Trifolium variegatum*.  
*Dianthra scintilla* Cockerell, 1916. Pomona Jour. Ent. Zool. 8: 50. ♀.  
*Halictoides eschscholtziae* Michener, 1937. Ann. and Mag. Nat. Hist. (10) 19: 393. ♂, ♀.
- Biology: Linsley, MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 71: 41-42 (floral relationships).
- spilura** (Cockerell). Calif. Pollen: Unknown, but visits flowers of *Eriogonum nudum*, *Gayophytum*, *Oenothera*.  
*Halictoides spilura* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 200. ♀.
- spinifera** (Viereck). Calif., Nev. Pollen: Unknown, but visits flowers of *Arenaria kingii*, *Sidalcea apicata*, *Trifolium monanthum*.  
*Cryptohalictoides spiniferus* Viereck, 1904. Ent. News 15: 261. ♂.
- Taxonomy: Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 199. ♂, ♀. — Michener, 1937. Ann. and Mag. Nat. Hist. (10) 19: 402. ♀.
- subdavidsoni** Bohart. Calif. Pollen: Unknown, but visits flowers of *Gayophytum diffusum*.  
*Dufourea subdavidsoni* Bohart, 1949. Ent. Soc. Amer., Ann. 42: 55. ♂, ♀.
- tarsata** Bohart. Calif. Pollen: Unknown, but visits flowers of *Cryptantha*, *Gilia*, *Linanthus parviflorus*, *Lupinus*, *Nemophila*.  
*Dufourea tarsata* Bohart, 1947. Ent. Soc. Amer., Ann. 40: 698. ♂, ♀.
- timberlakei** Bohart. Calif. (Mt. Pinos).  
*Dufourea timberlakei* Bohart, 1947. Ent. Soc. Amer., Ann. 40: 700. ♂.
- tinsleyi** (Cockerell). N. Mex.  
*Halictoides tinsleyi* Cockerell, 1898. Canad. Ent. 30: 52. ♀.

**trochantera** Bohart. Wash., Oreg., Wyo., Utah, Calif. Parasite: *Neopasites* sp. Pollen: Oligolege of *Phacelia* including *P. leucophylla*, *P. pringlei*, but also visits flowers of *Calochortus venustus*.

*Dufourea trochantera* Bohart, 1948. Ent. Soc. Amer., Ann. 41: 121. ♂, ♀.

Biology: Torchio, Rozen, Bohart and Favreau, 1967. N. Y. Ent. Soc., Jour. 75: 138-141 (nest architecture, provisioning, development, adult activity, pollen source, parasite).

**truncata** Timberlake. South. Calif. Pollen: Presumably an oligolege of *Camissonia* including *C. bistorta*, *C. dentata*, *C. veitchiana*, but also visits flowers of *Astragalus*, *Coreopsis californica*, *Cryptantha intermedia*.

*Dufourea (Halictoides) truncata* Timberlake, 1939. Ent. Soc. Amer., Ann. 32: 410. ♂, ♀.

**tularensis** Timberlake. Calif. (Three Rivers). Pollen: Unknown, but visits flowers of *Anisocoma acaulis*, *Eschscholzia californica*, *Layia glandulosa*, *Phacelia distans*, *P. douglasii*.

*Dufourea (Halictoides) tularensis* Timberlake, 1941. Ent. Soc. Amer., Ann. 34: 41. ♂, ♀.

**tuolumne** Bohart. Calif. Pollen: Unknown, but visits flowers of *Cryptantha*, *Gilia*, *Linanthus filipes*, *L. montanus*, *Lomatium*.

*Dufourea tuolumne* Bohart, 1947. Ent. Soc. Amer., Ann. 40: 694. ♂, ♀.

**vanduzeei** Bohart. Calif. (Monterey Co.).

*Dufourea vanduzeei* Bohart, 1947. Ent. Soc. Amer., Ann. 40: 696. ♂.

**vandykei** Bohart. Calif. Pollen: Unknown, but visits flowers of *Sphaeralcea ambigua*.

*Dufourea vandykei* Bohart, 1948. Ent. Soc. Amer., Ann. 41: 124. ♂, ♀.

**vernalis** Timberlake. Calif. (deserts). Pollen: Evidently polylectic, usually visits flowers of *Eschscholzia* including *E. minutiflora*, *E. parishii*, but also visits other flowers including *Argemone*, *Camissonia brevipes*, *C. clavaeformis*, *C. refracta*, *Malacothrix glabrata*, *Mentzelia involuerata*, *Phacelia distans*.

*Dufourea (Halictoides) vernalis* Timberlake, 1939. Ent. Soc. Amer., Ann. 32: 400. ♂, ♀.

Biology: Linsley, MacSwain and Raven, 1963. Calif. Univ. Pubs. Ent. 33: 19 (floral relationships).

**versatilis rubriventris** Michener. Calif.; Mexico (Baja California). Pollen: Oligolege of *Mimulus* including *M. diffusus*, *M. fremontii*, *M. guttatus*, *M. layneae*, *M. montioides*, *M. moschatus*, *M. primuloides*, *M. suksdorfii*, but also visits flowers of *Gilia*, *Nemophila*.

*Mimulapis versatilis rubriventris* Timberlake, 1941. Ent. Soc. Amer., Ann. 34: 38. ♀, ♂. Preocc.

*Dufourea (Halictoides) rubriventris* Michener, 1951. In Muesebeck, Krombein, Townes, U. S. Dept. Agr., Agr. Monog. 2: 1133. N. name.

**versatilis versatilis** (Bridwell). South. Calif. Pollen: Apparently an oligolege of *Mimulus*, but visits flowers of *Gilia achillaefolia*, *G. splendens*.

*Mimulapis versatilis* Bridwell, 1919. Hawaii. Ent. Soc., Proc. 4: 163. ♂, ♀.

**virgata** (Cockerell). Calif. Pollen: Collects pollen from flowers of *Camissonia boothii*, but visits a wide variety of flowers including *Amsinckia*, *Brodiaea capitata*, *Camissonia campestris*, *Convolvulus villosus*, *Coreopsis bigelovii*, *C. californica*, *Cryptantha intermedia*, *C. muricata*, *Descurainia sophia*, *Encelia californica*, *E. farinosa*, *Eriophyllum lanatum*, *Eschscholzia californica*, *Euphorbia albomarginata*, *Gilia achillaefolia*, *G. multicaulis*, *G. tenuifolia*, *G. tricolor diffusa*, *Hesperochiron*, *Layia elegans*, *L. glandulosa*, *Linanthus aureus*, *Lotus scoparius*, *Lupinus*, *Malacothrix*, *Nemophila*, *Phacelia douglasii*, *Plagiobothrys nothofulvus*, *Platystemon*, *Salvia columbariae*, *Stenotopsis linearifolius*, *Trifolium*.

*Halictoides virgatus* Cockerell, 1898. Amer. Ent. Soc., Trans. 25: 191. ♀, ♂.

Taxonomy: Cockerell, 1902. South. Calif. Acad. Sci., Bul. 1: 140.

Biology: Linsley, MacSwain and Raven, 1963. Calif. Univ. Pubs. Ent. 33: 19 (floral relationships).

**viridescens** (Crawford). Calif.

*Halictoides viridescens* Crawford, 1916. Insecutor Inscitiae Menstruus 4: 139. ♂.

**Genus MICRALICTOIDES Timberlake**

*Dufourea* subg. *Micralictoides* Timberlake, 1939. Ent. Soc. Amer., Ann. 32: 397.

Type-species: *Halictoides ruficaudus* Michener. Orig. desig.

Revision: Bohart, 1942. Pan-Pacific Ent. 18: 119-123.

**altadenae** (Michener). South. Calif. Pollen: Unknown, but visits flowers of *Chaenactis glabriuscula*, *Eriophyllum confertiflorum*.

*Halictoides altadenae* Michener, 1936. Ann. and Mag. Nat. Hist. (10) 19: 395. ♀, ♂.

**mojavensis** Bohart. South. Calif. Pollen: Unknown, but visits flowers of *Chaenactis brachypappa*, *Gilia multicaulis*, *Eschscholzia californica*, *Lasthenia gracilis*, *Layia platyglossa*, *Malacothrix californica*, *M. glabrata*, *Phacelia fremontii*, *Salvia columbariae*.

*Micralictoides mojavensis* Bohart, 1942. Pan-Pacific Ent. 18: 120. ♂, ♀.

**ruficaudus** (Michener). Calif. Pollen: Apparently an oligolege of *Eschscholzia californica*, but also visits flowers of *Gilia multicaulis*, *Nemophila menziesii*.

*Halictoides ruficaudus* Michener, 1936. Ann. and Mag. Nat. Hist. (10) 19: 397. ♀.

**Genus PROTODUFOUREA Timberlake**

*Protodufourea* Timberlake, 1955. Pan-Pacific Ent. 31: 105.

Type-species: *Protodufourea wasbaueri* Timberlake. Orig. desig.

Revision: Timberlake, 1955. Pan-Pacific Ent. 31: 105-108.

**parca** Timberlake. Calif. (Riverside Co.). Pollen: Oligolege of *Phacelia* including *P. distans*, *P. hispida*.

*Protodufourea parca* Timberlake, 1955. Pan-Pacific Ent. 31: 106. ♂.

**wasbaueri** Timberlake. Calif. (San Benito Co.). Pollen: Oligolege of *Emmenanthe penduliflora*.

*Protodufourea wasbaueri* Timberlake, 1955. Pan-Pacific Ent. 31: 107. ♂, ♀.

**Genus CONANTHALICTUS Cockerell**

Revision: Timberlake, 1961. Pan-Pacific Ent. 37: 145-160.

Biology: Rozen and McGinley, 1976. Amer. Mus. Novitates 2602: 1-6, 3 figs.

**Genus CONANTHALICTUS Subgenus CONANTHALICTUS Cockerell**

*Halictus* subg. *Conanthalictus* Cockerell, 1901. Ent. News 12: 209.

Type-species: *Halictus (Conanthalictus) conanthi* Cockerell. Monotypic.

**conanthi** (Cockerell). N. Mex. Pollen: Unknown, but visits flowers of *Nama hispidum*.

*Halictus (Conanthalictus) conanthi* Cockerell, 1901. Ent. News 12: 208. ♀.

**cotullensis** Crawford. Tex. (Cotulla).

*Conanthalictus cotullensis* Crawford, 1907. N. Y. Ent. Soc., Jour. 16: 182. ♀, ♂

**Genus CONANTHALICTUS Subgenus PHACELIAPIS Michener**

*Conanthalictus* subg. *Phaceliapis* Michener, 1942. N. Y. Ent. Soc., Jour. 50: 277.

Type-species: *Conanthalictus bakeri* Crawford. Orig. desig.

**bakeri** Crawford. South. Calif. Pollen: Unknown, but visits flowers of *Phacelia distans*, *P. tanacetifolia*.

*Conanthalictus Bakeri* Crawford, 1907. Invertebrata Pacifica 1: 197. ♀.

**caerulescens** Timberlake. Calif. (Riverside Co.), Nev. Pollen: Unknown, but visits flowers of *Phacelia crenulata*, *P. distans*.

*Conanthalictus caerulescens* Timberlake, 1961. Pan-Pacific Ent. 37: 148. ♂, ♀.

**cockerelli** Timberlake. Calif. (San Bernardino Co.). Pollen: Unknown, but visits flowers of *Eriodictyon*, *Phacelia fremontii*.

*Conanthalictus cockerelli* Timberlake, 1961. Pan-Pacific Ent. 37: 155. ♂, ♀.

- deserticola** Timberlake. South. Calif. (Imperial and Riverside Cos.). Pollen: Unknown, but visits flowers of *Camissonia brevipes*, *Nama demissum*.  
*Conanthalictus deserticola* Timberlake, 1961. Pan-Pacific Ent. 37: 152. ♂. Described under heading *Conanthalictus namatophilus* Timberlake, new species which is a printer's error according to Timberlake *in litt.*; also see Pan-Pacific Ent. 40: 200, 1964.
- macrops** Cockerell. South. Calif. (San Gabriel and San Bernardino Mts.). Pollen: Unknown, but visits flowers of *Malacothrix*, *Phacelia davidsonii*, *P. douglasii*, *Yucca whipplei*.  
*Conanthalictus macrops* Cockerell, 1916. Pomona Jour. Ent. Zool. 8: 51. ♂.
- mentzeliae** Timberlake. South. Calif. (San Bernardino, Kern, and Inyo Cos.), Nev. Pollen: Unknown, but visits flowers of *Malacothrix*, *Mentzelia affinis*, *M. albicaulis*, *M. micrantha*, *Phacelia*.  
*Conanthalictus mentzeliae* Timberlake, 1961. Pan-Pacific Ent. 37: 156. ♂, ♀.
- minor** Timberlake. South. Calif. (San Bernardino, Riverside and Inyo Cos.). Pollen: Unknown, but visits flowers of *Camissonia clavaeformis*, *Nama demissum*, *Phacelia*.  
*Conanthalictus minor* Timberlake, 1961. Pan-Pacific Ent. 37: 151. ♂, ♀. Described under heading *Conanthalictus deserticola* Timberlake, new species which is a printer's error according to Timberlake *in litt.*; also see Pan-Pacific Ent. 40: 200, 1964.
- namatophilus** Timberlake. South. Calif. (Imperial, Riverside and San Bernardino Cos.). Pollen: Unknown, but visits flowers of *Camissonia clavaeformis*, *Lotus scoparius*, *Nama demissum*, *Phacelia aff. fremontii*.  
*Conanthalictus namatophilus* Timberlake, 1961. Pan-Pacific Ent. 37: 153. ♂, ♀. Described under heading *Conanthalictus minor* Timberlake, new species which is a printer's error according to Timberlake *in litt.*; also see Pan-Pacific Ent. 40: 200, 1964.
- nigricans** Timberlake. South. Calif. Pollen: Unknown, but visits flowers of *Cryptantha intermedia*, *Emmenanthe*, *Phacelia brachyloba*, *P. distans*, *P. douglasii*, *P. grandiflora*, *P. minor*.  
*Conanthalictus nigricans* Timberlake, 1961. Pan-Pacific Ent. 37: 149. ♂, ♀.
- seminiger** Michener. South. Calif. Pollen: Collects pollen from flowers of *Eummenanthe penduliflora*, but also visits flowers of *Rhamnus crocea*.  
*Conanthalictus seminiger* Michener, 1937. Ann. and Mag. Nat. Hist. 10 (19): 326. ♀.
- wilmattae** Cockerell. South. Calif. (Colorado Desert). Pollen: Unknown, but visits flowers of *Phacelia distans*, *Prosopis juliflora*.  
*Conanthalictus wilmattae* Cockerell, 1936. Amer. Mus. Novitates 831: 2. ♀.

#### Genus SPHECODOSOMA Crawford

- Sphecodosoma* Crawford, 1907. N. Y. Ent. Soc., Jour. 15: 182.  
 Type-species: *Sphecodosoma pratti* Crawford. Monotypic and orig. desig.
- Taxonomy: Timberlake, 1961. Pan-Pacific Ent. 37: 158-160 (as subgenus).
- dicksoni** (Timberlake). South. Calif., Tex. (Davis Mts); Mexico (Durango). Pollen: Unknown, but visits flowers of *Coldenia*, *Nama demissum*, *N. hispidum*.  
*Conanthalictus dicksoni* Timberlake, 1961. Pan-Pacific Ent. 37: 158. ♀.
- pratti** Crawford. Tex. Pollen: Unknown, but visits flowers of *Lesquerella*.  
*Sphecodosoma pratti* Crawford, 1907. N. Y. Ent. Soc., Jour. 15: 183. ♀, ♂.

#### Genus MICHENERULA Bohart

- Michenerula* Bohart, 1965. Ent. Soc. Amer., Ann. 58: 320.  
 Type-species: *Michenerula beameri* Bohart. Monotypic and orig. desig.
- beameri** Bohart. Tex. (Marathon). Pollen: Unknown, but visits flowers of *Nama hispidum*.  
*Michenerula beameri* Bohart, 1965. Ent. Soc. Amer., Ann. 58: 320. ♂, ♀.

#### Genus XERALICTUS Cockerell

- Xeralictus* Cockerell, 1927. Pan-Pacific Ent. 4: 41.  
 Type-species: *Xeralictus timberlakei* Cockerell. Monotypic.
- Taxonomy: Eickwort, 1969. Ent. Soc. Amer., Ann. 62: 654 (subfamilial assignment).



**timberlakei** Cockerell. Calif. (Colorado Desert). Pollen: Oligolege of *Mentzelia involucrata*, but also visits other flowers for nectar including *Mohavea confertiflora*, *Phacelia crenulata*, *P. distans*.

*Xeralictus timberlakei* Cockerell, 1927. Pan-Pacific Ent. 4: 42. ♂.

#### SUBFAMILY NOMIINAE

Members of this subfamily are especially numerous in the Old World tropics including those of the Australian Region. They are relatively poorly represented in the Holarctic Region. Only the widespread genus *Nomia* is present in the Nearctic Region and apparently all of the species are polyleges, obtaining their pollen and nectar from the flowers of a wide variety of both native and introduced plants. However, some of the species (e.g., *Nomia nevadensis* Cresson and *N. triangulifera* Vachal) appear to collect pollen only from the flowers of the Compositae. At least one of the species, the alkali bee (*N. melanderi* Cockerell), is an exceptionally valuable pollinator of alfalfa (*Medicago sativa*) and has been managed successfully in artificial nesting sites so as to enhance the pollination of this important agricultural crop.

#### Genus NOMIA Latreille

##### Genus NOMIA Subgenus NOMIA Latreille

*Nomia* Latreille, 1804. Nouv. Dict. Hist. Nat., v. 24, p. 182.

Type-species: *Andrena curvipes* Fabricius. Monotypic.

*Nitocris* Rafinesque, 1815. Analyse de la nature, p. 123. Proposed unnecessarily for *Nomia* Latreille.

This subgenus is found only in the Old World.

##### Genus NOMIA Subgenus CURVINOMIA Michener

*Nomia* subg. *Paranomia* Friese, 1897. Festschr. fuenfzig. bestehene Ver. Schles.

Insektenk. Breslau, p. 48. Preocc.

Type-species: *Nomia chalybeata* Smith. Desig. by Cockerell, 1910.

*Nomia* subg. *Paranomia* Michener, 1944. Amer. Mus. Nat. Hist., Bul. 82: 251. N. name. Preocc.

*Nomia* subg. *Curvinomia* Michener, 1944. Amer. Mus. Nat. Hist., Bul. 82: 251.

Type-species: *Nomia californiensis* Michener. Monotypic and orig. desig. (= *Nomia tetrazonata* Cockerell).

Revision: Ribble, 1965. Kansas Univ. Sci. Bul. 45: 277-309, figs. (N. Amer. spp.).

Taxonomy: Ribble, 1968. Wyo. Univ. Agr. Expt. Sta., Sci. Monog. 11: 15-18 (tax. notes, geogr. and floral records).

**angustitibialis** Ribble. Southeastern Ariz. to Guerrero, Mex. Pollen: Unknown, but visits flowers of *Baccharis glutinosa*, *Condalia lycioides*, *Larrea tridentata*, *Melilotus alba*.

*Nomia* (*Curvinomia*) *angustitibialis* Ribble, 1965. Kansas Univ. Sci. Bul. 45: 292. ♂, ♀.

**fedorensis** Cockerell. Southwestern Kans., Okla., Tex., south to Veracruz, Mexico. Pollen: Unknown, but visits flowers of *Cassia*, *Dalea grisea*, *Gaillardia*, *Helianthus*, *Mimosa*, *Rhynchosia americana*, *Tephrosia virginiana*.

*Nomia fedorensis* Cockerell, 1910. Ann. and Mag. Nat. Hist. (8) 6: 277. ♀, ♂.

Biology: Cockerell, 1934. Amer. Mus. Novitates 697: 4 (nest).

**foxii** Dalla Torre. Colo. (Denver), S. Dak. (Big Stone City). Senior synonym of either *Nomia universitatis* Cockerell or *N. tetrazonata* Cockerell, see Hurd and Linsley, 1974. Ent.

Soc. Wash., Proc. 76: 198.

*Nomia punctata* Fox, 1893. Ent. News, 4: 135. ♀. Preocc.

*Nomia foxii* Dalla Torre, 1896. Cat. Hym., v. 10, p. 167. N. name.

Taxonomy: Hurd and Linsley, 1974. Ent. Soc. Wash., Proc. 76: 198 (tax. status).

**maneei** Cockerell. N. J., N. C. to Fla. west to Okla. and Ala. Parasite: *Pseudomethoca vanduzeei* Bradley. Pollen: Unknown, but visits flowers of *Asclepias tuberosa*,

*Desmodium ciliare*, *Eriogonum baileyi*, *Galactia*, *Lespedeza capitata*, *L. repens*, *Phaseolus polystachios*, *Strophostyles*.

*Nomia maneei* Cockerell, 1910. Ann. and Mag. Nat. Hist. (8) 6: 276. ♀.

Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 508, figs. (redescription).

**mesillensis** Cockerell. South. Colo., Utah, Ariz., N. Mex., Tex., south to Jalisco, Mexico. Pollen:

Polylege of a wide variety of flowers including *Aloysia wrightii*, *Asclepias linaria*, *A. subverticillata*, *Baccharis glutinosa*, *Cevallia sinuata*, *Cirsium*, *Cleome jonesi*, *C. serrulata*, *Crotalaria pumila*, *Croton*, *Crusea subulata*, *Eriogonum abertianum*, *E. annuum*, *Eysenhardtia polystachya*, *Gossypium*, *Guardiola tulocarpa*, *Gutierrezia sarothrae*, *Haplopappus*, *Helianthus annuus*, *Koeberlinia spinosa*, *Larrea tridentata*, *Lepidium thurberi*, *Lotus wrightii*, *Medicago sativa*, *Melilotus alba*, *M. officinalis*, *Mentzelia pumila*, *Nolina*, *Petalostemon candidum*, *Psoralea tenuifolia*, *Solanum elaeagnifolium*, *S. rostratum*, *Verbesina encelioides*. Predator: *Blepharepium secabile* (Walk.), *Mallophora bromleyi* Curran.

*Nomia mesillensis* Cockerell, 1908. Ann. and Mag. Nat. Hist. (8) 2: 334. ♀.

Taxonomy: Hurd and Linsley, 1974. Ent. Soc. Wash., Proc. 76: 198-199 (tax. status).

**tetrazonata tetrazonata** Cockerell. South. Calif. and Nev. to N. Mex. south into Mexico (Baja

California and Sonora). Pollen: Polylege of a wide variety of flowers including *Acacia*, *Allionia incarnata*, *Antigonon*, *Asclepias*, *Astragalus preussii*, *Baccharis glutinosa*, *B. sarothroides*, *Boerhaavia*, *Cercidium floridum*, *Chrysothamnus*, *Cissus trifoliata*, *Cleome*, *Cleomella longipes*, *Colubrina*, *Condalia lycioides*, *Croton californicus*, *Cuscuta*, *Dalea*, *Encelia farinosa*, *Eriogonum fasciculatum*, *E. heermannii*, *E. inflatum*, *E. nodosum*, *Euphorbia*, *Glycine max*, *Gossypium*, *Gutierrezia sarothrae*, *Heliotropium curassavicum*, *Heterotheca subaxillaris*, *Hymenothrix wislizenii*, *Hyptis emoryi*, *Kallstroemia grandiflora*, *Larrea tridentata*, *Lepidium thurberi*, *Lotus scoparius*, *Medicago sativa*, *Melaleuca*, *Melilotus alba*, *Nolina parryi*, *Pectis papposa*, *Penstemon palmeri*, *Philbertia heterophylla*, *Prosopis juliflora*, *Sapindus saponaria*, *Solanum elaeagnifolium*, *S. rostratum*, *Stanleya pinnata*, *Tamarix gallica*, *Verbesina encelioides*, *Wislizenia refracta*, *Zea mays*.

*Nomia tetrazonata* Cockerell, 1910. U. S. Natl. Mus., Proc. 38: 297. ♂.

*Nomia moctezumae* Crawford, 1911. U. S. Natl. Mus., Proc. 39: 618. ♀.

*Nomia californiensis* Michener, 1937. Ann. and Mag. Nat. Hist. (10) 19: 318. ♀.

**tetrazonata uvaldensis** Cockerell. N. Mex., Tex.; Mexico. Pollen: Unknown, but visits flowers of *Acacia greggii*, *Baccharis glutinosa*, *Cercidium texanum*, *Melilotus alba*,

*Parkinsonia aculeata*, *Prosopis juliflora*, *Solanum elaeagnifolium*, *Teucrium cubense*.

*Nomia uvaldensis* Cockerell, 1930. In Cockerell and Blair, Amer. Mus. Novitates 433: 13. ♀.

*Nomia zabriskii* Cockerell and Blair, 1930. Amer. Mus. Novitates 433: 13. ♂.

*Nomia parksi* Cockerell, 1934. Amer. Mus. Novitates 697: 7. ♀.

**universitatis** Cockerell. N. Dak. to Tex. between Mississippi River and Rocky Mts. Pollen:

Unknown, but visits flowers of *Amorpha canescens*, *Astragalus gracilis*, *Dalea*, *Medicago sativa*, *Melilotus alba*, *M. officinalis*, *Petalostemon purpureum*, *Psoralea tenuiflora*, *Rudbeckia*, *Symphoricarpos occidentalis*. Predator: *Diogmites angustipennis* Loew.

*Nomia universitatis* Cockerell, 1908. Ann. and Mag. Nat. Hist. (8) 2: 334. ♂.

### Genus NOMIA Subgenus ACUNOMIA Cockerell

*Nomia* subg. *Acunomia* Cockerell, 1930. In Cockerell and Blair, Amer. Mus. Novitates 433: 11.

Type-species: *Nomia nortoni* Cresson. Orig. desig.

Revision: Ribble, 1965. Kansas Univ. Sci. Bul. 45: 282-283, 309-359, figs. (N. Amer. spp., includes summary of biological literature).

Taxonomy: Ribble, 1968. Wyo. Univ. Agr. Expt. Sta., Sci. Monog. 11: 1-15 (alkali bee and related species, including summary of biological literature).

**howardi** Crawford. South. Utah, south to South. Calif. and southwestern Ariz.; Mexico (Baja California). Pollen: Polylege of a wide variety of flowers including *Acacia greggii*, *Aster spinosus*, *Carthamnus tinctorius*, *Cucumis melo*, *Gossypium*, *Heliotropium curassavicum*, *Isocoma veneta*, *Lippia lanceolata*, *Medicago sativa*, *Melilotus alba*, *Phyla nodiflora*, *Pluchea sericea*, *Prosopis pubescens*, *Salix exigua*, *Tamarix gallica*, *T. petandra*. Predator: *Imparipis americanus* (Banks).

*Nomia howardi* Crawford, 1911. U. S. Natl. Mus., Proc. 39: 617. ♀.

*Nomia howardi vanduzeei* Cockerell, 1924. Calif. Acad. Sci., Proc. (4) 12: 540. ♀.

*Nomia californica peninsularis* Cockerell, 1930. In Cockerell and Blair, Amer. Mus. Novitates 433: 12.

Biology: Linsley, 1946. Jour. Econ. Ent. 6: 18-29 (pollination).

**melanderi** Cockerell. Centr. Wash. to South. Calif., east to Wyo. Introduced into S. Dak. (Brookings and Hecla) and B. C. (Ashcroft and Kamloops). Parasite: *Dasygnutilla vesta* (Cress.)?, *Euphytamima nomivora* James, *Heterostylum robustum* O. S., *Nemognatha* sp., *Nomada suavis* Cress., *Physocephala texana* (Will.), *Physoconops fronto* (Will.), *Pseudomethocha propinqua* (Cress.)?, *Zodion obliquefasciatum* (Macq.), *Zonitis atripennis flavida* LeC. Pollen: Polylege of a wide variety of plants especially the Leguminosae including alfalfa, but also visits the flowers of *Achillea*, *Allium*, *Apium graveolens*, *Asclepias speciosa*, *A. subverticillata*, *Aster*, *Astragalus*, *Baccharis emoryi*, *Berula erecta*, *Beta vulgaris*, *Brassica geniculata*, *B. incana*, *Centromadia pungens*, *Chrysothamnus nauseosus*, *Cirsium*, *Citrullus vulgaris*, *Cleome lutea*, *C. serrulata*, *Convolvulus arvensis*, *Coreopsis*, *Crepis glauca*, *C. runcinata*, *Cressa cretica*, *Croton californicus*, *Cuscuta salina*, *Daucus carota*, *Dipsacus*, *Eremocarpus setigerus*, *Erigeron*, *Eriogonum*, *Eschscholzia californica*, *Gossypium*, *Grindelia*, *Haplopappus acradenioides*, *Helianthus*, *Heliotropium curassavicum*, *Hemizonia pungens*, *Lippia lanceolata*, *Lotus americanus*, *L. purshianus*, *Melilotus alba*, *M. indica*, *Mentha spicata*, *Phyla lanceolata*, *Pluchea camphorata*, *P. sericea*, *Polygonum lapathifolium*, *Ribes*, *Salsola kali*, *Sicyos*, *Sisymbrium altissimum*, *Solanum elaeagnifolium*, *S. tuberosum*, *Solidago occidentalis*, *Tamarix gallica*, *Tribulus terrestris*, *Trifolium hybridum*, *T. pratense*, *T. repens*, *Wislizenia refracta*, *Zea mays*. Predator: Badgers, blackbirds, *Cicindela haemorrhagica* LeC., *C. pusillus* Say, *Efferia straminea* (Will.), *Formica fusca* Linn., *Imparipis americanus* (Banks), magpies, meadowlarks, *Microtus* sp., *Mus musculus* Linn., *Pogonomyrmex occidentalis* (Cress.), robins, skunks, English sparrows, starlings, weasels.

*Nomia melanderi* Cockerell, 1906. Canad. Ent. 38: 279. ♀. *Lapsus calami*.

*Nomia melanderi* Cockerell, 1908. Ann. and Mag. Nat. Hist. (8) 2: 334. Emend.

*Nomia californica* Cockerell, 1910. U. S. Natl. Mus., Proc. 38: 296. ♀.

*Nomia acus* Cockerell, 1910. U. S. Natl. Mus., Proc. 38: 296. ♂.

*Nomia melanderi paysoni* Cockerell, 1925. Ann. and Mag. Nat. Hist. (9) 16: 621. ♂.

Taxonomy: Michener, 1953. Kansas Univ. Sci. Bul. 35: 1031, figs. (larva).

Biology: Stephen and Evans, 1960. Oreg. Agr. Expt. Sta. Tech. Bul. 52: 1-39, 5 figs, 2 tables (life history, parasites, associates). — Frick, 1962. Ent. Soc. Amer., Ann. 55: 5-15 (ecology, parasite). — Hackwell and Stephen, 1966. Pan-Pacific Ent. 42: 196-200 (eclosion and duration of larval development). — Ribble, 1968. Wyo. Univ. Agr. Expt. Sta., Sci. Monog. 11: 2-11 (summary of literature). — Cross and Bohart, 1969. Kansas Ent. Soc., Jour. 42: 195-219, 6 figs., 5 tables (phoretic behavior of associated mites). — Telford, Johansen and Eves, 1972. Mededel. Fakult. Landbouwwetensch. Gent 37: 776-783 (management practices and insecticide poisoning). — Parker and Potter, 1974. Environ. Ent. 3: 739-743, 5 figs. (introduction and establishment). — Batra, 1976. Kans. Ent. Soc., Jour. 49: 18-22, 2 tables (comparative efficiency in alfalfa pollination). — Mayer and Johansen, 1976. Ent. Soc. Amer., Bul. 22: 423-425 (bibliography).

**nortoni cressoni** Westwood. Ariz. (Santa Cruz Co.), south to Puebla, Mexico. Pollen: Unknown, but visits flowers of *Asclepias*, *Dalea*, *Eysenhardtia polystachya*, *Stachys bigelovii*.

*Nomia Cressoni* Westwood, 1875. Ent. Soc. London, Trans., p. 218. ♂.

**nortoni nortoni** Cresson. Penn., south to Fla., west to Idaho, Colo. and N. Mex.; Mexico (Coahuila). Pollen: Polylege of a wide variety of flowers including *Amorpha fruticosa*,

*Aster*, *Borreria*, *Brazoria truncata*, *Callirhoe leiocarpa*, *Cassia cinerea*, *C. fasciculata*, *Cirsium altissimum*, *C. vulgare*, *Clethra*, *Coreopsis cardaminefolia*, *Dalea aurea*, *D. multiflora*, *Desmodium paniculatum*, *Engelmannia pinnatifida*, *Eryngium yuccifolium*, *Eupomoea*, *Euphorbia marginata*, *Gaillardia*, *Gossypium*, *Grindelia squarrosa*, *Helenium autumnale*, *Helianthus maximiliani*, *Yuccastrum*, *Lycium halimifolium*, *Marrubium vulgare*, *Medicago sativa*, *Melilotus alba*, *Mentha longifolia*, *Monarda citriodora*, *M. punctata*, *Oenothera biennis*, *Petalostemon microphyllum*, *P. purpureum*, *Phacelia*, *Polygonum*, *Pontederia cordata*, *Prosopis*, *Pycnanthemum flexuosum*, *P. virginianum*, *Ratibida columnifera*, *R. pinnata*, *Rhus copalina*, *Solanum rostratum*, *S. torreyi*, *Solidago rigida*, *Verbena officinalis*, *Yucca glauca*.

*Nomia nortoni* Cresson, 1868. Amer. Ent. Soc., Trans. 1: 385. ♀, ♂.

*Nomia nortoni* var. *plebeia* Cockerell, 1910. Ann. and Mag. Nat. Hist. (8) 6: 276. ♀.

Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 510, figs. (redescription).

Biology: Cockerell, 1934. Amer. Mus. Novitates 697: 7. — Ribble, 1965. Kansas Univ. Sci. Bul. 45: 316-318 (nesting habits, parasites, predators).

### Genus NOMIA Subgenus EPINOMIA Ashmead

*Epinomia* Ashmead, 1899. Amer. Ent. Soc., Trans. 26: 88.

Type-species: *Nomia triangulifera* Vachal. Monotypic and orig. desig. (= *Nomia persimilis* Cockerell).

Revision: Cross, 1958. Kansas Univ. Sci. Bul. 38: 1261-1301, 4 figs. (included spp., contains biological information).

*micheneri* Cross. South. Ariz. and Tex., south to Jalisco and Guanajuato, Mexico. Pollen:

Unknown, but males visit flowers of *Eysenhardtia polystachya*, *Guardiola tulocarpa*, *Helianthus*.

*Nomia (Epinomia) micheneri* Cross, 1958. Kansas Univ. Sci. Bul. 38: 1273. ♂, ♀.

*nevadensis angelesia* Cockerell. Oreg., Calif., Nev.; Mexico (extreme northwest Baja California). Parasite: *Rhipiphorus epinomia* Linsley and MacSwain. Pollen: Polylege of a wide variety of flowers including *Aster spinosa*, *Brassica incana*, *Calendula*, *Centromadia pungens*, *Chrysothamnus*, *Coreopsis lanceolata*, *Croton californicus*, *Erigeron canadense*, *E. linifolius*, *Eriogonum fasciculatum*, *E. gracile*, *Grindelia camporum*, *Gnaphalium beneolens*, *Gutierrezia californica*, *G. sarothrae*, *Haplopappus palmeri*, *H. vernonioides*, *Helianthus gracilentus*, *Heterotheca grandiflora*, *Lepidospartum squamatum*, *Lippia filiformis*, *Lotus americanus*, *Marrubium vulgare*, *Medicago sativa*, *Melilotus alba*, *Pectis papposa*, *Pluchea camphorata*, *Polygonum lapathifolium*, *Senecio douglasii*, *Solidago occidentalis*, *Stephanomeria exigua*, *S. virgata*, *Tamarix gallica*, *Trichostema*, *Wislizenia refracta*.

*Nomia arizonensis angelesia* Cockerell, 1910. U. S. Natl. Mus., Proc. 38: 293. ♂.

Taxonomy: Michener, 1953. Kansas Univ. Sci. Bul. 35: 1029, figs. (larva).

*nevadensis arizonensis* Cockerell. Utah, Ariz., south. Calif. (Colorado Desert), N. Mex., south to Jalisco, Mexico. Pollen: Polylege of a wide variety of flowers including *Asclepias*, *Baccharis glutinosa*, *Chrysothamnus*, *Cleome serrulata*, *Eriogonum*, *Euphorbia*, *Eysenhardtia polystachya*, *Grindelia squarrosa*, *Guardiola tulocarpa*, *Gutierrezia microcephala*, *G. sarothrae*, *Haplopappus acradenius*, *H. spinulosus*, *Helianthus*, *Hymenothrix wislizeni*, *Hymenoxys*, *Lygodesmia juncea*, *Pectis papposa*, *Psilostrophe cooperi*, *Solanum elaeagnifolium*, *Sphaeralcea*, *Verbesina encelioides*, *Wislizenia refracta*. Predator: *Philanthus ventilabris* Fabr.

*Nomia arizonensis* Cockerell, 1899. Entomologist, 32: 128. ♂.

Biology: Alcock and Gamboa, 1975. Ariz. Acad. Sci. 10: 163 (predator).

*nevadensis bakeri* Cockerell. Fla. west to Wyo., Colo., N. Mex.; Mexico (Tamaulipas). Parasite: *Rhipiphorus nomiae* Rivnay. Pollen: Polylege of a wide variety of flowers including *Aster*, *Bidens involucrata*, *Boltonia asteroides*, *Chrysopsis microcephala*, *Coreopsis*, *Dalea lanata*, *Grindelia*, *Haplopappus*, *Helenium*, *Heterotheca*, *Isopappus*, *Melilotus alba*, *Prianopsis*, *Prosopis*, *Solidago*, *Thelesperma gracile*, *Verbesina encelioides*.  
*Nomia bakeri* Cockerell, 1898. Entomologist, 31: 32. ♂.

*Nomia pattoni* Cockerell, 1910. U. S. Natl. Mus., Proc. 38: 292. ♀, ♂.

*Nomia bakeri* var. *rufibasis* Cockerell, 1930. In Cockerell and Blair, Amer. Mus. Novitates 433: 14.

Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 512-513, figs. (redescription).

Biology: Hicks, 1926. Colo. Univ., Studies 15: 222. — Cockerell, 1934. Amer. Mus. Novitates 697: 4. — Kerfoot, 1964. Kansas Ent. Soc., Jour. 37: 152-157, 1 fig.

*nevadensis nevadensis* Cresson. Nev. (Nye and White Pine Cos.).

*Nomia nevadensis* Cresson, 1874. Amer. Ent. Soc., Trans. 5: 101. ♀, ♂.

*triangulifera* Vachal. N. Dak., Minn. and Ill. west to Utah and N. Mex. Parasite: *Rhipiphorus solidaginis* (Pierce), *Triepeolus mesillae* Cockerell. Pollen: Unknown, but visits flowers of *Bidens involucreta*, *Cleome serrulata*, *Gilia*, *Grindelia squarrosa*, *Helianthus annuus*, *H. lenticularis*, *H. maximiliani*, *H. petiolaris*, *Medicago sativa*, *Polygonum*, *Rudbeckia trilobata*, *Silphium perfoliatum*, *Solidago*, *Vernonia*.

*Nomia triangulifera* Vachal, 1897. Misc. Ent. 5: 9. ♂.

*Nomia persimilis* Cockerell, 1898. Denison Univ. Sci. Labs., Bul. 11: 50, 72. ♀, ♂.

Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 513-515, figs. (redescription).

Biology: Pierce, 1904. Nebr. Univ., Studies, 4: 181 (habits, parasite). — Rau, 1929. Psyche 36: 243. — Cross and Bohart, 1960. Kansas Univ. Sci. Bul. 41: 761-792.

### Genus NOMIA Subgenus DIEUNOMIA Cockerell

*Eunomia* Cresson, 1875. In Wheeler, Rpt. Geog. Geol. Expl. Survey west of 100th Meridian, v. 5, p. 722. Preocc.

Type-species: *Eunomia marginipennis* Cresson. Desig. by Cockerell, 1910.

(= *Nomia heteropoda kirbii* Smith).

*Dieunomia* Cockerell, 1899. Entomologist 32: 14. N. name.

*Monia* (!) Howard, 1901. Insect Book, pl. IV, figs. 34, 38.

Revision: Blair, 1935. N. Y. Ent. Soc., Jour. 43: 201-214, pl. XVI.

*apacha* Cresson. Nebr., Colo., N. Mex., Tex.

*Nomia?* *apacha* Cresson, 1868. Amer. Ent. Soc., Trans. 1: 386. ♀.

*bolliana bolliana* Cockerell. N. Mex., Tex.

*Nomia bolliana* Cockerell, 1910. Ann. and Mag. Nat. Hist. 8 (5): 259. ♀.

Taxonomy: Cockerell, 1910. U. S. Natl. Mus., Proc. 38: 295. ♀, ♂.

*bolliana helenii* Cockerell. Tex.

*Nomia bolliana helenii* Cockerell, 1936. Amer. Mus. Novitates 831: 2. ♀.

*heteropoda heteropoda* Say. Man., Minn., Wis., Ill., Ind., Ohio south to Md., Ga., Fla. and Miss.

Pollen: Unknown, but visits flowers of *Bidens bipinnata*, *Eupatorium*, *Helenium*, *Helianthus*.

*Nomia?* *heteropoda* Say, 1824. In Keating, Narr. Long's 2nd Exped., v. 2, p. 349. ♂.

*Andrena valida* Say, 1837. Boston Jour. Nat. Hist. 1: 393. ♀.

*Nomia heteropoda validescens* Blair, 1935. N. Y. Ent. Soc., Jour. 43: 206. ♂.

*Nomia heteropoda subvalida* Blair, 1935. N. Y. Ent. Soc., Jour. 43: 206. ♀.

Taxonomy: Cockerell, 1934. Amer. Mus. Novitates 697: 4. — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 507-508, figs. (redescription).

*heteropoda kirbii* Smith. Ga. and Fla. west to South. Calif., north to Colo., Nebr., and Ill., south to Tex. and Mexico; apparently incorrectly recorded from Brazil. Pollen:

Unknown, but visits flowers of *Helianthus*.

*Nomia Kirbii* Smith, 1865. Ent. Soc. London, Trans. (3) 2: 398. ♂.

*Eunomia marginipennis* Cresson, 1875. In Wheeler, Rpt. Geog. Geol. Expl. Survey west of 100th Meridian, v. 5, p. 722. ♀, ♂.

*Nomia heteropoda* var. *semivalida* Cockerell, 1934. Amer. Mus. Novitates 697: 5. ♂.

*Nomia heteropoda* var. *atripennis* Cockerell, 1934. Amer. Mus. Novitates 697: 6. ♀, ♂.

*Nomia heteropoda semirubra* Cockerell, 1934. Amer. Mus. Novitates 697: 6. ♀, ♂.

*Nomia heteropoda* var. *subvalidior* Blair, 1935. N. Y. Ent. Soc., Jour. 43: 208. ♀.

Taxonomy: Westwood, 1875. Ent. Soc. London, Trans. p. 217. — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 508 (tax. characters).

*mesillae* (Cockerell). Colo., N. Mex., Tex.

*Dieunomia mesillae* Cockerell, 1899. Entomologist 32: 266. ♂.

Taxonomy: Cockerell, 1930. Amer. Mus. Novitates 433: 10. ♂, ♀.

*xerophila* (Cockerell). Colo., Utah, N. Mex., Ariz.

*Dieunomia xerophila* Cockerell, 1899. Entomologist 32: 265. ♂, ♀.

### Genus NOMIA Subgenus UNASSIGNED

*tacita* Cameron. N. Mex. Probably not Nearctic.

*Nomia tacita* Cameron, 1902. Amer. Ent. Soc., Trans. 28: 376. ♂.

### NOMEN NUDUM IN NOMIA LATREILLE

*Nomia birkmanii* Birkman, 1899. Ent. News 23: 244.

### SUBFAMILY HALICTINAE

This very large, diverse and nearly cosmopolitan subfamily of bees exhibits both solitary behavior and nearly every degree of sociality ranging from subsocial through communal, semisocial to eusocial behavior. Most of the species nest in the ground, but some nest in pre-existing holes in wood and sometimes in rotten or decaying wood.

Although the species of this subfamily are known to visit the flowers of a great variety of plants for pollen and nectar, some groups of species are oligolectic (e.g., *Hemihalictus* and *Sphecodogastra*). Since much of the floral information recorded in the literature is in need of critical evaluation, no attempt has been made to list the floral records for the majority of the species in this subfamily. Partial summaries of the floral records or comments about them may be found in a number of studies including Mitchell (1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 332-506), Moldenke and Neff (1974. Origin and Structure of Ecosystems (IBP) Tech. Rpt. 74-75: 9-135), Ordway (1966. Kansas Univ. Sci. Bul. 46: 509-624), Roberts (1969. Kansas Univ. Sci. Bul. 48: 689-719), and Robertson (1928. Flowers and insects, Carlinville, Ill., 221 pp.).

Taxonomy: Eickwort and Fischer, 1963. Ent. Soc. Amer., Ann. 56: 348-354 (hind tibial spurs). — Eickwort, 1969. Ent. Soc. Amer., Ann. 62: 658-660 (classification and nest architecture).

Biology: Michener, 1958. Ecology 39: 207-217 (distribution of nests in earth banks).

— Michener and Lange, 1958. Science 127: 1046-1047 (primitive social behavior).

— Hamilton, 1964. Jour. Theoret. Biol. 7: 17-52 (genetical evolution). — Michener, 1964. Ins. Sociaux 11: 317-342 (reproductive efficiency). — Lin, 1964. Ins. Sociaux 11: 187-192

(parasitism as a factor in the evolution of social behavior). — Batra, 1966. Indian Jour. Ent. 28: 375-393. — Knerer and Atwood, 1966. Science 152: 1262-1263 (polymorphism). — Knerer

and Atwood, 1966. Canad. Ent. 98: 1337-1339 (nest architecture and taxonomy). — Knerer and Atwood, 1967 (1966). Ent. Soc. Ontario, Proc. 97: 103-110 (parasitization). — Knerer

and Plateaux-Quenu, 1966. Acad. Sci. Paris, Compt. Rend. 263: 1622-1625 (cell coverings).

— Knerer and Plateaux-Quenu, 1966. Acad. Sci. Paris, Compt. Rend. 263: 1759-1761

(polymorphism). — Knerer and Plateaux-Quenu, 1966. Acad. Sci. Paris, Compt. Rend. 263: 2014-2017 (polygyny). — Michener, 1966. Animal Behav. 14: 126-129 (worker interaction).

— Knerer and Plateaux-Quenu, 1967. Acad. Sci. Paris, Compt. Rend. 264: 1-3 (life history).

— Knerer and Plateaux-Quenu, 1967. Acad. Sci. Paris, Compt. Rend. 264: 651-653

(production of lining). — Knerer and Plateaux-Quenu, 1967. Acad. Sci. Paris, Compt. Rend. 264: 1096-1099 (male production). — Plateaux-Quenu, 1967. Soc. Ent. France, Ann. (n. s.) 3:

859-866 (social evolution). — Batra, 1968. Kansas Ent. Soc., Jour. 41: 120-133 (behavior in nests). — Bonelli, 1969. Soc. Ent. Italiana, Bol. 48: 68-78 (social evolution). — Knerer, 1969.

Internat. Union Study Social Insects VI Congr. Bern, Proc. pp. 101-107 (social structure). — Knerer, 1969. Science 164: 429-430 (brood care). — Knerer, 1969. Ent. News 80: 141-147

(nest architecture and defense). — Knerer, 1969. Canad. Jour. Zool. 47: 925-930 (synergistic evolution). — Houston, 1970. Australian Jour. Zool. 18: 345-351 (male soldier caste). — May,

1970. Science 170: 651-652 (brood care). — Batra, 1970. Science 170: 652 (brood care).

— Plateaux-Quenu, 1972. La Biologie des abeilles primitives. Masson et Cie, Paris, 200 pp.

—Bell and Hawkins, 1974. Jour. Compar. Physiol. 93: 183-193 (intraspecific agonistic interactions). —Barrows, 1975. Ins. Sociaux 22: 307-332, 12 figs., 2 tables (mating behavior). —Barrows, 1976. Kans. Ent. Soc., Jour. 49: 105-119, 2 figs., 3 tables (mating behavior). —Waddington, 1976. Psyche 83: 112-118 (foraging patterns at flowers of *Convolvulus arvensis*).

Morphology: Eickwort and Fischer, 1963. Ent. Soc. Amer., Ann. 56: 348-354, 18 figs. (tibial spurs). —Lello, 1971. Kansas Ent. Soc., Jour. 44: 14-20 (sting apparatus).

#### TRIBE AUGOCHLORINI

Taxonomy: Eickwort, 1969. Ent. Soc. Amer., Ann. 62: 652-653 (classification and nest architecture). —Eickwort, 1969. Kansas Univ. Sci. Bul. 48: 325-524, 418 figs., 3 tables (generic classification).

#### Genus AUGOCHLOROPSIS Cockerell

##### Genus AUGOCHLOROPSIS Subgenus AUGOCHLOROPSIS Cockerell

*Augochlora* subg. *Augochloropsis* Cockerell, 1897. Canad. Ent. 29: 4.

Type-species: *Augochlora (Augochloropsis) subignita* Cockerell. Orig. desig. (= *Augochlora ignita* Smith).

This subgenus is found only south of the United States.

##### Genus AUGOCHLOROPSIS Subgenus PARAUGOCHLOROPSIS Schrottky

*Augochloropsis* subg. *Paraugochloropsis* Schrottky, 1906. Ztschr. System. Hym. Dipt. 6: 312.

Type-species: *Augochloropsis (Paraugochloropsis) lycorais* Schrottky. Monotypic.

*Augochlora* subg. *Tetrachlora* Schrottky, 1909. Deut. Ent. Ztschr., p. 481.

Type-species: *Halictus multiplex* Vachal. Monotypic.

*Paraugochlora* Schrottky, 1910. Deut. Ent. Ztschr., p. 540.

Type-species: *Augochlora spinolae* Cockerell. Orig. desig.

*Rivalisia* Strand, 1921. Arch. Naturges. Abt. A, 87: 270.

Type-species: *Rivalisia metallica* Strand. Monotypic.

*Augochlora* subg. *Glyptobasis* Moure, 1941. Arq. Zool. Estado Sao Paulo 2: 48. Preocc.

Type-species: *Augochlora (Glyptobasis) chloera* Moure. Orig. desig.

*Glyptobasis* Moure, 1941. Arq. do Mus. Paranaense 1: 98. N. name.

*Augochloropsis* subg. *Glyptochlora* Moure, 1958. N. Y. Ent. Soc., Jour. 66: 188. This subgenus has questionably been placed as a synonym of *Paraugochloropsis*.

Type-species: *Megalopta ornata* Smith. Orig. desig.

Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 463-469 (spp. of United States). —Eickwort, 1969. Kansas Univ. Sci. Bul. 48: 414-416 (generic synonymy and tax. characters).

**anonyma** (Cockerell). Coastal Plains, N. C. to Fla. Pollen: *Polylege*, visiting flowers of *Baccharis*, *Bidens*, *Cirsium*, *Erigeron*, *Helenium*, *Hypericum*, *Ilex*, *Linaria*, *Melilotus*, *Metopium*, *Ocimum*, *Polygonum*, *Pycnanthemum*, *Rhus*, *Rubus*, *Trifolium*.  
*Augochlora anonyma* Cockerell, 1922. U. S. Natl. Mus., Proc. 60: 15. ♂.

**metallica fulgida** (Smith). Mich. to New England, south to La. and Fla. Pollen: *Polylege*, visiting flowers of *Aronia*, *Aster*, *Azalea*, *Barbarea*, *Chrysanthemum*, *Cornus*, *Eryngium*, *Fragaria*, *Geranium*, *Hypericum*, *Ilex*, *Linaria*, *Melilotus*, *Rhus*, *Rubus*, *Solidago*, *Taxaracum*.

*Augochlora fulgida* Smith, 1853. Cat. Hym. Brit. Mus. v. 1, p. 79. ♀.

*Augochlora lucidula* Smith, 1853. Cat. Hym. Brit. Mus. v. 1, p. 81. ♀.

Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 465 (tax. characters and status).

**metallica metallica** (Fabricius). New England and Ont., south to Fla. and Ariz.; Mexico to Panama and Colombia (Gorgona Island). Pollen: *Polylege*, visiting flowers of *Apocynum*,

*Arabis*, *Aralia*, *Aronia*, *Asclepias*, *Aster*, *Bidens*, *Blephilia*, *Brassica*, *Cacalia*, *Cassia*, *Caulophyllum*, *Ceanothus*, *Celastrus*, *Cercis*, *Chrysanthemum*, *Cicuta*, *Circaea*, *Claytonia*, *Coreopsis*, *Cornus*, *Crataegus*, *Cornuta grandiflora*, *Cuphea balsamona*, *Diospyros*, *Dodecatheon*, *Erigenia*, *Eryngium*, *Eupatorium*, *Fragaria*, *Geranium*, *Gerardia*, *Gnaphalium*, *Gonolobus*, *Haplopappus*, *Hydrangea*, *Hydrophyllum*, *Hypericum*, *Ilex*, *Lepachys*, *Lippia*, *Lycopus*, *Malva*, *Melilotus*, *Nepeta*, *Osmorrhiza*, *Parthenium*, *Petalostemon*, *Polygonum*, *Polytaenia*, *Prunus*, *Pycnanthemum*, *Rhamnus*, *Rhus*, *Ribes*, *Rosa*, *Rubus*, *Sagittaria*, *Salix*, *Sanicula*, *Scrophularia*, *Smilacina*, *Solidago*, *Specularia*, *Smyphoricarpus*, *Taenidia*, *Thaspium*, *Tilia*, *Trifolium*, *Verbascum*, *Verbena*, *Veronica*, *Zanthoxylum*, *Zizia*. Predator: *Philanthus gibbosus* (Fabr.), *P. solivagus* Say.

*Andrena metallica* Fabricius, 1793. Ent. syst. 2: 309. ♀.

*Augochlora cuprea* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 79. ♀.

*Augochlora viridula* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 81. ♂.

*Augochlora fervida* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 81. ♂.

*Augochlora cleomis* Titus, 1901. Canad. Ent. 33: 135. ♀, ♂.

*Halictus* (*Augochlora*) *chorisis* Vachal, 1903. Misc. Ent. 11: 136. ♀.

*Halictus* (*Augochlora*) *viridissimus* Viereck, 1910. In Smith, N. J. State Mus., Ann. Rpt.

1909: 688. N. name; proposed to replace *viridula* Smith, preoccupied in *Halictus*.

*Augochlora fulvofimbriata* Friese, 1916. Stettin. Ent. Ztg. 77: 315. ♀.

Taxonomy: Michener, 1954. Amer. Mus. Nat. Hist., Bul. 104: 88-90 (redescription, as *fulvofimbriata*). — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 465-466, fig. 110 (tax. characters, synonymy). — Moure, 1960. Studia Ent. 3: 102-103 (notes on type, synonymy).

**sumptuosa** (Smith). Maine to Fla., west to S. Dak., Colo., Ariz., and Tex. Pollen: Polylege, visiting flowers of *Asclepias*, *Berlandiera*, *Bidens*, *Clethra*, *Crataegus*, *Eriogonum*, *Eryngium*, *Helianthus*, *Hypericum*, *Melilotus*, *Silphium*, *Stachys*, *Vaccinium*.

*Augochlora sumptuosa* Smith, 1853. Cat. Hym. Brit. Mus., vol. 1, p. 82. ♀.

*Augochlora humeralis* Patton, 1879. U. S. Geol. Geog. Survey, Bul. 5: 365. ♀, ♂.

*Agapostemon caeruleus* Ashmead, 1890. Colo. Biol. Assoc., Bul. 1: 7. ♀.

*Halictus pattoni* Vachal, 1903. Misc. Ent. 11: 132. N. name. Preocc.

*Augochlora sumptuosa bolliana* Cockerell, 1909. Ann. and Mag. Nat. Hist. (8) 4: 31. ♀.

*Augochlora lacustris* Cockerell, 1922. U. S. Natl. Mus., Proc. 60 (18): 14. ♀.

*Augochlora floridica* Cockerell, 1922. U. S. Natl. Mus., Proc. 60 (18): 14. ♂.

Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 466-467, 469, figs. 110, 111 (redescription, synonymy).

Biology: Smith, 1898. Ent. News 9: 157, 320. — Smith, 1901. N. Y. Ent. Soc., Jour. 9: 52.

— Michener and Lange, 1959. Amer. Mus. Novitates 1924: 36.

### Genus AUGOCHLORA Smith

#### Genus AUGOCHLORA Subgenus AUGOCHLORA Smith

*Augochlora* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 73.

Type-species: *Halictus purus* Say. Desig. by Cockerell, 1923.

*Oxystoglossa* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 83.

Type-species: *Oxystoglossa decorata* Smith. Monotypic.

*Odontochlora* Schrottky, 1909. La Plata Mus., Rev. 16: 14.

Type-species: *Augochlora muelleri* Cockerell. Orig. desig.

The species of this subgenus nest in dead wood either in pre-existing burrows of other insects or in soft rotting wood.

Taxonomy: Michener, 1954. Amer. Mus. Nat. Hist., Bul. 104: 59 (generic status). — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 456-458 (spp. of eastern U. S.). — Eickwort, 1969. Kansas Univ. Sci. Bul. 48: 420-422 (tax. characters).

Biology: Eickwort and Eickwort, 1973. Kansas Ent. Soc., Jour. 46: 17-22, figs. (nests).



**azteca** (Vachal). South. Tex.; Mexico.

*Halictus (Oxytroglossa) azteca* Vachal, 1911. Misc. Ent. 19: 45, 110. ♀.

**nigrocyanea** Cockerell. South. Tex.; Mexico to Panama.

*Augochlora nigrocyanea* Cockerell, 1897. Amer. Ent. Soc., Trans. 24: 144. ♀.

**pura mosieri** Cockerell. South. Fla. Pollen: Polylege, visiting flowers of *Bidens*, *Cattleya*, *Flaveria*, *Hamelia*, *Melaleuca*, *Psychotrea*, *Salix*, *Sida*.

*Augochlora mosieri* Cockerell, 1922. U. S. Natl. Mus., Proc. 60: 15. ♀.

**pura pura** (Say). Que. and Maine to Minn., south to Tex. and Fla. Parasite: *Rhipiphorus schwarzi* LeC., *R. stylopoides* Newm.? Pollen: Polylege, visits a wide variety of flowers including *Acer*, *Agastache*, *Althaea*, *Amelanchier*, *Arabis*, *Aruncus*, *Asclepias*, *Aster*, *Barbarea*, *Bidens*, *Blephilia*, *Cacalia*, *Caulophyllum*, *Cercis*, *Chaerophyllum*, *Cicuta*, *Coreopsis*, *Cornus*, *Cryptotaenia*, *Diospyros*, *Dirca*, *Evonymus*, *Fragaria*, *Geranium*, *Gerardia*, *Haplopappus*, *Heliopsis*, *Helianthus*, *Houstonia*, *Hydrangea*, *Ilex*, *Lippia*, *Ludwigia*, *Malus*, *Malva*, *Melilotus*, *Osmorrhiza*, *Padus*, *Polemonium*, *Polygonum*, *Prunus*, *Ranunculus*, *Rhamnus*, *Rhus*, *Rudbeckia*, *Rubus*, *Salix*, *Smilacina*, *Solidago*, *Smythoricarpus*, *Taenidia*, *Teucrium*, *Thaspium*, *Tradescantia*, *Vaccinium*, *Verbena*, *Verbesina*, *Veronica*, *Vitis*, *Zizia*. Predator: *Philanthus gibbosus* (Fabr.), *P. lepidus* Cress., *P. solivagus* Say.

*Halictus purus* Say, 1837. Boston Jour. Nat. Hist. 1: 395. ♀, ♂.

*Augochlora festiva* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 80. ♀.

*Augochlora Robertsoni* Cockerell, 1897. Canad. Ent. 29: 69. ♀.

*Augochlora Banksiella* Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 19: 533. ♀.

*Halictus astios* Vachal, 1911. Misc. Ent. 19: 44. ♀.

*Halictus astios* var.(?) *fuscatipes* Vachal, 1911. Misc. Ent. 19: 45. ♀.

*Halictus asaphes* Vachal, 1911. Misc. Ent. 19: 49. ♀.

*Augochlora palmarum* Cockerell, 1922. U. S. Natl. Mus., Proc. 60 (18): 15. ♀, ♂.

**Taxonomy:** Michener, 1953. Kansas Univ. Sci. Bul. 35: 1028, figs. 57-59, 64 (larva).

**Biology:** Rau, 1922. Acad. Sci. St. Louis, Trans. 24 (7): 32. — Blackman and Stage, 1924. N. Y. State Col. Forestry, Syracuse Univ. Tech. Pub. 17: 197. — Rau, 1934. Acad. Sci. St. Louis, Trans. 28: 223. — Stockhammer, 1961. North Central Branch, Ent. Soc. Amer., Proc. 16: 17-18. — Stockhammer, 1966. Kansas Ent. Soc., Jour. 39: 157-192 (nesting habits, life cycle). — May and Stockhammer, 1968. Kansas Ent. Soc., Jour. 41: 339-341, 1 fig. (induced nesting in cellulose powder). — May, 1972. Kansas Ent. Soc., Jour. 45: 439-449, 4 figs. (water uptake during larval development). — Barrows, 1973. Kansas Ent. Soc., Jour. 46: 496-499 (induced soil nesting). — May, 1973. Kansas Ent. Soc., Jour. 46: 301-310, 6 tables (brood cell recognition). — Barrows, 1974. Fla. Entomologist 57: 189-193 (aggregation behavior). — May, 1974. Kansas Ent. Soc., Jour. 47: 504-516, 5 figs. (nature and origin of brood cell linings).

### Genus AUGOCHLORA Subgenus OXYSTOGLOSSELLA Eickwort

*Augochlora* subg. *Oxytroglossella* Eickwort, 1969. Kansas Univ. Sci. Bul. 48: 422.

Type-species: *Augochlora (Oxytroglossella) cordiaefloris* Cockerell. Orig. desig.

All the members of this subgenus which have been studied have been found to construct their nests in the ground.

**Taxonomy:** Eickwort, 1969. Kansas Univ. Sci. Bul. 48: 422-423.

**Biology:** Eickwort and Eickwort, 1972. Kansas Ent. Soc., Jour. 45: 18-45 (life history, larva, pupa).

**azteca** Cockerell. South. Tex.; Mexico.

*Augochlora azteca* Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 19: 534. ♀.

### Genus AUGOCHLORA Subgenus UNKNOWN

**obliqua** Provancher. B. C. (Vancouver).

*Augochlora obliqua* Provancher, 1888. Addit. Corr. Faune Ent. Canada, Hym., p. 318. ♀.

## Genus AUGOCHLORELLA Sandhouse

*Augochlorella* Sandhouse, 1937. Wash. Acad. Sci., Jour. 27: 66.

Type-species: *Augochlora gratioia* Smith. Orig. desig.

*Oxytroglossidia* Moure, 1943. Rev. Ent. 14: 473.

Type-species: *Oxytroglossidia uraniella* Moure. Orig. desig.

Revision: Ordway, 1966. Kansas Univ. Sci. Bul. 509-624, 92 figs., 3 tables (spp. north of Mexico). —Eickwort, 1969. Kansas Univ. Sci. Bul. 48: 424-426 (generic classification).

Biology: Ordway, 1961. North Central Branch, Ent. Soc. Amer., Proc. 16: 17. —Ordway, 1964. Kansas Ent. Soc., Jour. 37: 139-152. (parasite). —Eickwort, 1966. Kansas Ent. Soc., Jour. 39: 410-429. (phoretic mite).

*aurata* (Smith). N. C., Ga., Fla., Ala., Tex.; Mexico. Pollen: Polylege, visiting flowers of *Aster*, *Cirsium*, *Citrus*, *Crataegus*, *Lythrum*, *Opuntia*, *Polygonum*, *Rubus*, *Viburnum*.

*Augochlora aurata* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 82. ♀.

*Augochlora austrina* Robertson, 1893. Amer. Ent. Soc., Trans. 20: 147. ♀.

*bracteata* Ordway. Northeast. Tex., south into eastern Mexico (Hidalgo).

*Augochlorella bracteata* Ordway, 1966. Kansas Univ. Sci. Bul. 46: 570. ♀, ♂.

*gratioia* (Smith). N. J. and D. C., south to Fla., east to Tex. Pollen: Polylege, visiting flowers of *Aster*, *Ampelopsis*, *Asclepias*, *Berteroa*, *Bidens*, *Callicarpa*, *Cassia*, *Chrysobalanus*, *Chrysopsis*, *Cirsium*, *Citrus*, *Clethra*, *Crataegus*, *Crotonopsis*, *Cunila*, *Erigeron*, *Eryngium*, *Galactia*, *Gerardia*, *Gossypium*, *Helianthus*, *Hypericum*, *Ilex*, *Ixora*, *Jacquemontia*, *Lepidium*, *Malva*, *Melilotus*, *Oenothera*, *Opuntia*, *Piriqueta*, *Polygala*, *Polygonum*, *Pterocaulon*, *Pycnothymus*, *Rhus*, *Rubus*, *Sabal*, *Senecio*, *Solidago*, *Taraxacum*, *Teucrium*, *Vaccinium*, *Verbena*, *Warea*.

*Augochlora gratioia* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 80. ♀.

*neglectula neglectula* (Cockerell). Ariz., N. Mex., Tex., south to Panama. Pollen: Polylege, visiting flowers of *Acacia*, *Aesculus*, *Baccharis*, *Ceanothus*, *Chilopsis*, *Chrysanthemum*, *Chrysopsis*, *Dalea*, *Descurainia*, *Echinocactus*, *Erigeron*, *Eschscholzia*, *Fendlera*, *Gaillardia*, *Gossypium*, *Gutierrezia*, *Helenium*, *Heterotheca*, *Lepidium*, *Manzanita*, *Melilotus*, *Opuntia*, *Penstemon*, *Prunus*, *Pyrus*, *Rosa*, *Senecio*, *Sida*, *Sisymbrium*, *Sphaeralcea*, *Ungnadia*. The subspecies *Augochlorella neglectula maritima* Ordway occurs in the sand dunes along the west coast of Mexico.

*Augochlora neglectula* Cockerell, 1897. N. Mex. Agr. Expt. Sta. Bul. 24: 43. ♀, ♂.

*Augochlora dimissa* Cockerell, 1923. U. S. Natl. Mus., Proc. 63: 5. ♀.

*persimilis* (Viereck). Pa., west to Minn., south to Ga., Ala., La., and Tex. Parasite:

*Myrmilloides grandiceps* (Blake), *Pseudomethoca frigida* (Sm.), *Sphecodes pimpinellae* Robt. Pollen: Polylege, visits a great variety of flowers including *Achillea*, *Agastache*, *Ailanthus*, *Alisma*, *Althaea*, *Ammannia*, *Amorpha*, *Antennaria*, *Anthemis*, *Aphanes*, *Apocynum*, *Arabis*, *Asclepias*, *Asparagus*, *Aster*, *Barbarea*, *Bidens*, *Blephilia*, *Borago*, *Brassica*, *Callirhoe*, *Camassia*, *Campanula*, *Capsella*, *Cardamine*, *Cassia*, *Ceanothus*, *Celastrus*, *Cerastium*, *Chrysanthemum*, *Chrysopsis*, *Cichorium*, *Cirsium*, *Citrullus*, *Claytonia*, *Convolvulus*, *Coreopsis*, *Cornus*, *Cotoneaster*, *Crataegus*, *Cucurbita*, *Daucus*, *Descurainia*, *Diospyros*, *Echinacea*, *Erigeron*, *Erysimum*, *Eupatorium*, *Euphorbia*, *Fragaria*, *Geranium*, *Geum*, *Gnaphalium*, *Gutierrezia*, *Hedeoma*, *Helenium*, *Helianthus*, *Heliopsis*, *Heterotheca*, *Heuchera*, *Houstonia*, *Hypoxis*, *Ipomoea*, *Justicia*, *Kolkwitzia*, *Krigia*, *Lepidium*, *Lepedeza*, *Lippia*, *Lobelia*, *Lotus*, *Ludwigia*, *Lycopus*, *Malva*, *Medicago*, *Melilotus*, *Monarda*, *Nepeta*, *Nothoscordum*, *Oenothera*, *Oxalis*, *Paonia*, *Parosela*, *Parthenium*, *Passiflora*, *Pastinaca*, *Petalostemon*, *Phacelia*, *Plantago*, *Polemonium*, *Polygonum*, *Polytaenia*, *Potentilla*, *Prunus*, *Psoralea*, *Pycnanthemum*, *Ranunculus*, *Raphanus*, *Rhus*, *Rorippa*, *Rosa*, *Rubus*, *Rudbeckia*, *Sabatia*, *Sagittaria*, *Salix*, *Salvia*, *Senecio*, *Sida*, *Silphium*, *Sisyrinchium*, *Smilacina*, *Smilax*, *Solidago*, *Specularia*, *Stellaria*, *Symphoricarpos*, *Taenidia*, *Taraxacum*, *Thaspium*, *Tradescantia*, *Trifolium*, *Valerianella*, *Verbena*, *Verbesina*, *Vernonia*, *Veronica*, *Viburnum*, *Zigadenus*, *Zizia*. Predator: *Philanthus bilunatus* Cress., *P. gibbosus* (Fabr.), *P. lepidus* Cress., *P. politus politus* Say, *P. solivagus* Say.

*Augochlora similis* Robertson, 1893. Amer. Ent. Soc., Trans. 20: 146. ♀, ♂. Preocc.

*Halictus (Oxytroglossa) persimilis* Viereck, 1910. In Smith, N. J. State Mus., Ann. Rpt. 1909: 688. N. name.

*Halictus xystris* Vachal, 1911. Misc. Ent. 19: 50. ♀.

Biology: Pearson, 1933. Ecol. Monog. 3: 386, 396 (as *Oxytroglossa similis*). —Ordway, 1965. Insectes Sociaux 12: 291-308 (caste differentiation). —Eickwort, 1966. Kansas Ent. Soc., Jour. 39: 410-429 (phoretic mite). —Ordway, 1966. Kansas Ent. Soc., Jour. 39: 270-313 (bionomics).

**pomoniella** (Cockerell). Calif., Nev., Utah, Ariz. N. Mex. (Willow Creek); Mexico (Baja California, south along west coast to Chiapas and Yucatan), Guatemala and Costa Rica. Ecology: Nests in abandoned cells of *Sceliphron*. Pollen: Polylege, visits a great variety of flowers including *Acacia*, *Achillea*, *Agoseris*, *Arctostaphylos*, *Arenaria*, *Argemone*, *Asclepias*, *Aster*, *Astragalus*, *Baccharis*, *Baileya*, *Bebbia*, *Brassica*, *Brodiaea*, *Calandrinia*, *Calochortus*, *Carnegiea*, *Centaurea*, *Cercidium*, *Chaenactis*, *Chrysopsis*, *Chrysothamnus*, *Cirsium*, *Cissus*, *Clarkia*, *Cleome*, *Convolvulus*, *Coreopsis*, *Corethrogyne*, *Croton*, *Cryptantha*, *Dalea*, *Datura*, *Diplacus*, *Encelia*, *Enceliopsis*, *Eremocarpus*, *Eriastrum*, *Eriodictyon*, *Eriogonum*, *Eriophyllum*, *Erodium*, *Eryngium*, *Eschscholzia*, *Euclidean*, *Fendlerella*, *Gazania*, *Gilia*, *Gnaphalium*, *Gossypium*, *Grossularia*, *Gutierrezia*, *Haplopappus*, *Helianthus*, *Heliotropium*, *Hemizonia*, *Heterotheca*, *Hymenothrix*, *Isomeris*, *Kallstroemia*, *Lantana*, *Layia*, *Lessingia*, *Lomatium*, *Lotus*, *Malacothamnus*, *Marrubium*, *Melilotus*, *Mentha*, *Mirabilis*, *Monardella*, *Oenothera*, *Opuntia*, *Osmorhiza*, *Penstemon*, *Perideridia*, *Petalonyx*, *Peucephyllum*, *Phacelia*, *Platystemon*, *Ranunculus*, *Raphanus*, *Rhus*, *Salix*, *Salvia*, *Sanicula*, *Scrophularia*, *Senecio*, *Sisymbrium*, *Sisyrinchium*, *Solanum*, *Solidago*, *Sphaeralcea*, *Stanleya*, *Stephanomeria*, *Tamarix*, *Trichostema*, *Wyethia* *Zauschneria*.

*Augochlora pomoniella* Cockerell, 1915. Pomona Jour. Ent. Zool. 7: 232. ♀.

*Augochlora utahensis* Michener, 1937. Ann. and Mag. Nat. Hist. (10) 19: 314. ♀.

**striata** (Provancher). Southern Canada to south. Fla., west to Rocky Mountains. Parasite: *Myrmilloides grandiceps* (Blake), *Pseudomethoca frigida* (Sm.); *Sphecodes pimpinellae* Robt. Pollen: Polylege, visits a great variety of flowers including *Achillea*, *Aesculus*, *Agastache*, *Agoseris*, *Althaea*, *Amelanchier*, *Amorpha*, *Anemone*, *Anemone*, *Antennaria*, *Apocynum*, *Aquilegia*, *Arabis*, *Aralia*, *Argemone*, *Aruncus*, *Asclepias*, *Aster*, *Astragalus*, *Barbarea*, *Berteroa*, *Bidens*, *Brassica*, *Callirhoe*, *Calopogon*, *Camassia*, *Camelina*, *Campanula*, *Capsella*, *Cardamine*, *Carduus*, *Cassia*, *Caulophyllum*, *Ceanothus*, *Celastrus*, *Centaurea*, *Cephalanthus* *Cercis*, *Chaerophyllum*, *Chrysanthemum*, *Chrysopsis*, *Cichorium*, *Cicuta*, *Circaea*, *Cirsium*, *Citrullus*, *Claytonia*, *Clethra*, *Convolvulus*, *Coreopsis*, *Cornus*, *Crataegus*, *Cryptantha*, *Cryptotaenia*, *Cubelium*, *Cucumis*, *Cucurbita*, *Cunila*, *Daucus*, *Dentaria*, *Diervilla*, *Dodacatheon*, *Echinacea*, *Echium*, *Ellisia*, *Erigenia*, *Erigeron*, *Erysimum*, *Evonymus*, *Eupatorium*, *Euphorbia*, *Fragaria*, *Gaillardia*, *Geranium*, *Gerardia*, *Glechoma*, *Gnaphalium*, *Gossypium*, *Grindelia*, *Gutierrezia*, *Haplopappus*, *Hedeoma*, *Heiracium*, *Helenium*, *Helianthus*, *Heliopsis*, *Heracleum*, *Heterotheca*, *Heuchera*, *Houstonia*, *Hybanthus*, *Hydrangea*, *Hydrocotyle*, *Hydrolea*, *Hydrophyllum*, *Hypericum*, *Impatiens*, *Inula*, *Ipomoea*, *Iris*, *Isopyrum*, *Kolkwitzia*, *Krigia*, *Lactuca*, *Lathyrus*, *Lepidium*, *Lespedeza*, *Lesquerella*, *Linum*, *Lippia*, *Lobelia*, *Lomatium*, *Lonicera*, *Lotus*, *Lycopersicum*, *Lycopus*, *Lythrum*, *Malus*, *Malva*, *Medicago*, *Melilotus*, *Mentha*, *Mertensia*, *Mikania*, *Monarda*, *Myosoton*, *Nigella*, *Nothoscordum*, *Oenothera*, *Onopordium*, *Opuntia*, *Osmorrhiza*, *Oxalis*, *Paeonia*, *Parthenium*, *Parthenocissus*, *Paspalum*, *Pastinaca*, *Penstemon*, *Perideridia*, *Petalostemon*, *Phryma*, *Physalis*, *Polemonium*, *Polygonatum*, *Polygonum*, *Polymnia*, *Polytaenia*, *Pontederia*, *Potentilla*, *Prenanthes*, *Prunella*, *Prunus*, *Psoralea*, *Ptelea*, *Pteridium*, *Pycnanthemum*, *Pyrrolophappus*, *Pyrus*, *Ranunculus*, *Ratibida*, *Rhamnus*, *Rhus*, *Ribes*, *Rorippa*, *Rosa*, *Rubus*, *Rudbeckia*, *Sagittaria*, *Salix*, *Salvia*, *Sanicula*, *Sapindus*, *Satureja*, *Scrophularia*, *Scutellaria*, *Sedum*, *Senecio*, *Sericocarpus*, *Sida*, *Silphium*, *Sisymbrium*, *Sisyrinchium*, *Smilacina*, *Smilax*, *Solanum*, *Solidago*, *Sonchus*, *Specularia*, *Sphaeralcea*, *Spiraea*, *Stellaria*, *Stokesia*, *Strophostyles*, *Symphoricarpos*, *Syringa*, *Taenidia*, *Tanacetum*, *Taraxacum*, *Teucrium*, *Thapsium*, *Tradesantia*, *Tragopogon*, *Trifolium*, *Trillium*, *Triosteum*, *Vaccinium*, *Verbascum*, *Verbena*, *Vernonia*, *Viburnum*,

- Vicia*, *Viola*, *Vitis*, *Waldsteinia*, *Xanthoxylum*, *Zizia*. Predator: *Philanthus bilunatus* Cress., *P. gibbosus* (Fabr.), *P. lepidus* Cress., *P. politus politus* Say, *P. solivagus* Say. *Augochlora striata* Provancher, 1888. Addit. Corr. Faune Ent. Canada, Hym., p. 317. ♀, ♂. *Augochlora matilida* Robertson, 1893. Amer. Ent. Soc., Trans. 20: 147. ♀. *Augochlora confusa* Robertson, 1897. Acad. Sci. St. Louis, Trans. 7: 324. ♀, ♂. *Augochlora coloradensis* Titus, 1901. Canad. Ent. 33: 133. ♀, ♂. *Augochlora pseudopurella* Strand, 1914. Arch. Naturgesch. 80 (Abt. A, Heft 1): 163.
- Biology: Rau, 1922. Acad. Sci. St. Louis, Trans. 24: 32 (as *confusus*). — Hicks, 1931. Canad. Ent. 63: 176 (as *coloradensis*). — Evans and Lin, 1959. Wasmann Jour. Biol. 17: 120, 123, 127, 131 (as *aurata* and *striata*). — Michener and Wille, 1961. Kansas Univ. Sci. Bul. 42: 1130. — Knerer and Atwood, 1962. Ent. Soc. Ontario, Proc. 92: 174. — Ordway, 1964. Kansas Ent. Soc., Jour. 37: 139-152. (parasite). — Evans, 1964. Psyche 71: 142, 147. — Michener, 1964. Amer. Zool. 4: 233. (nests). — Ordway, 1965. Ins. Sociaux 12: 291-308 (caste differentiation). — Ordway, 1966. Kansas Ent. Soc., Jour. 39: 270-313 (bionomics). — Eickwort, 1966. Kansas Ent. Soc., Jour. 39: 410-429 (phoretic mite).

### Genus PSEUDAUGOCHLOROPSIS Schrottky

*Augochloropsis* subg. *Pseudaugochloropsis* Schrottky, 1906. Ztschr. System. Hym. Dipt. 6: 313.

Type-species: *Halictus nigromarginatus* Spinola. Desig. by Schrottky, 1909.

*Caenagochlora* subg. *Pseudaugochlora* Michener, 1954. Amer. Mus. Nat. Hist., Bul. 104: 77.

Type-species: *Halictus nigromarginatus* Spinola. Orig. desig.

Taxonomy: Eickwort, 1969. Kansas Univ. Sci. Bul. 48: 429-432 (generic classification).

Biology: Michener and Kerfoot, 1967. Kansas Ent. Soc., Jour. 40: 214-232 (nests, social behavior).

**graminea** (Fabricius). Tex. to Argentina; West Indies. Pollen: Possibly restricted to the pollen of *Solanum* (including *S. wendlandii*) and *Cassia*.

*Megilla graminea* Fabricius, 1804. Syst. Piez., p. 334.

*Halictus nigromarginatus* Spinola, 1841. Soc. Ent. France, Ann. 10: 137. ♀.

*Augochlora camure* Holmberg, 1884. Soc. Cient. Argentina, An. 18: 213. ♀.

?*Augochlora chapadae* Cockerell, 1900. Acad. Nat. Sci. Phila., Proc., p. 361, 375.

Taxonomy: Moure, 1960. Studia Ent. 3: 105-106 (synonymy, notes on type). — Eickwort, 1967. Kansas Ent. Soc., Jour. 40: 232-237 (tax. characters and status).

Biology: Michener and Kerfoot, 1967. Kansas Ent. Soc., Jour. 40: 214-232 (nests, sex ratio, social behavior).

### Genus TEMNOSOMA Smith

*Temnosoma* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 238.

Type-species: *Temnosoma metallicum* Smith. Monotypic.

*Micraugochlora* Schrottky, 1909. Rev. Mus. La Plata, 16: 138.

Type-species: *Micraugochlora sphaerocephala* Schrottky. Monotypic.

*Temnosoma* subg. *Temnosomula* Ogloblin, 1953. Soc. Ent. Argentina, Bol. 2: 2.

Type-species: *Temnosoma* (*Temnosomula*) *platensis* Ogloblin. Monotypic and orig. desig.

Taxonomy: Eickwort, 1969. Kansas Univ. Sci. Bul. 48: 446-448 (generic classification).

**smaragdinum** Smith. Ariz. (Tucson); Mexico, Centr. Amer.

*Temnosoma smaragdinum* Smith, 1879. Descr. New Species Hym. Brit. Mus., p. 29. ♂.

### TRIBE HALICTINI

Taxonomy: Eickwort, 1969. Ent. Soc. Amer., Ann. 62: 654-656 (classification and nest architecture).

## Genus AGAPOSTEMON Guérin-Meneville

*Andrena* subg. *Agapostemon* Guérin-Meneville, 1844. Iconogr. Regne Anim., Ins., v. 3, p. 448.

Type-species: *Apis femoralis* Guérin-Meneville. Monotypic. (= *Apis viridula* Fabricius).

The bees of this genus are known to visit a great variety of flowers for nectar and pollen. Since the data pertaining to the floral visitations of these bees are conveniently available (see discussion of the subfamily Halictinae), this information is not repeated here or presented in the species treated below.

Revision: Roberts, 1972. Kansas Univ. Sci. Bul. 49: 437-590, 228 figs. (included spp.).

Taxonomy: Roberts, 1973. Oreg. State Univ. Agr. Expt. Sta. Tech. Bul. 125: 1-23 (northwest. Amer. spp.).

Biology: Roberts, 1969. Kansas Univ. Sci. Bul. 48: 689-719, 21 figs. (natural history).

## SPECIES GROUP SPLENDENS

**angelicus** Cockerell. N. Dak., Colo. and Iowa, south to Tex., N. Mex., Ariz. and south. Calif.; Mexico (Chihuahua, Durango and Sonora). Predator: *Philanthus albopilosus* Cress.  
*Agapostemon angelicus* Cockerell, 1924. Calif. Acad. Sci., Proc. (4) 12: 537. ♀.

Biology: Linsley, 1962. Ent. Soc. Amer., Ann. 55: 159, fig. 5 (sleep). — Evans, 1975. Ent. Soc. Amer., Ann. 68: 891 (predator).

**texanus** Cresson. Transcont. south. Canada and U. S., south to centr. Costa Rica. Predator: *Philanthus crabroniformis* Smith.

*Agapostemon texanus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 255. ♀.

*Agapostemon texanus subtilior* Cockerell, 1898. Ent. News 9: 27. ♀ ?

*Agapostemon borealis* Crawford, 1901. Nebr. Acad. Sci., Proc. 7: 160. ♀.

*Agapostemon californicus* Crawford, 1901. Nebr. Acad. Sci., Proc. 7: 164. ♀.

*Halictus (Agapostemon) brachycerus* Vachal, 1903. Misc. Ent. 11: 101. ♂.

*Agapostemon texanus iowensis* Cockerell, 1910. Ann. and Mag. Nat. Hist. (8) 5: 363. ♀.

*Agapostemon proscriptus* Cockerell, 1912. Ann. and Mag. Nat. Hist. (8) 10: 24. ♀.

*Agapostemon joseanus* Friese, 1916. Stettin. Ent. Ztg. 77: 310. ♀.

*Agapostemon sulfuripes* Friese, 1916. Stettin. Ent. Ztg. 77: 310. ♂.

*Agapostemon cyanozonus* Cockerell, 1924. Calif. Acad. Sci., Proc. (4) 12: 539. ♂.

*Agapostemon proscriptellus* Cockerell, 1924. Calif. Acad. Sci., Proc. (4) 12: 538. ♀.

*Agapostemon texanus vandykei* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 191. ♀.

*Agapostemon californicus psammobius* Cockerell, 1937. Pan-Pacific Ent. 13: 150. ♂, ♀.

*Agapostemon angelicus idahoensis* Michener, 1937. Ann. and Mag. Nat. Hist. (10) 19: 314. ♀.

*Agapostemon californicus clementinus* Cockerell, 1939. Calif. Acad. Sci., Proc. (4) 23: 431. ♀, ♂.

**splendens** (Lepeletier). Ont. and Maine to Sask., south to Fla., Ala., Miss., La., Tex., N. Mex., Ariz.; Mexico (Gulf coast to Veracruz).

*Halictus splendens* Lepeletier, 1841. Hist. Nat. Ins., Hym., v. 2, p. 283. ♀.

*Agapostemon aeruginosus* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 86. ♀.

Biology: Stevens, 1921. Canad. Ent. 53: 68.

## SPECIES GROUP SERICEUS

**cockerelli** Crawford. Wyo. Colo., Tex., N. Mex., Ariz.; Mexico.

*Agapostemon Cockerelli* Crawford, 1901. Nebr. Acad. Sci., Proc. 7: 161. ♀.

**femoratus** Crawford. B. C., Alta., N. Dak., south to N. Mex., Ariz., Nev., Calif., Mexico (Baja California).

*Agapostemon femoratus* Crawford, 1901. Nebr. Acad. Sci., Proc. 7: 162. ♂, ♀.

**sericeus** (Forster). Ont., Maine to Fla., west to N. Dak., south to Tex. Predator: *Philanthus sanbornii* Cress.

*Apis sericea* Forster, 1771. Novae Species Insectorum, Centuria vol. I, p. 91. ♂.

*Halictus radiatus* Say, 1837. Boston Jour. Nat. Hist. 1: 394. ♀.

*Agapostemon pulchra* Smith, 1853. Cat. Hym. Brit. Mus. v. 1, p. 87. ♀.

*Agapostemon sulcatulus* Cockerell, 1909. Ann. and Mag. Nat. Hist. (8) 4: 25. ♂.

Taxonomy: van der Vecht, 1959. Ent. Ber. 19: 69 (tax. status). — Roberts, 1972. Kansas Univ. Sci. Bul. 49: 554 (tax. status). — Day and Fitton, 1977. Biol. Jour. Linn. Soc. 9: 39. ♂ (tax. status of type, synonymy).

Biology: Rau, 1934. Acad. Sci. St. Louis, Trans. 28: 219.

#### SPECIES GROUP VIRESCENS

**coloradinus** Crawford. S. Dak., Nebr., Kans., Okla., Tex., N. Mex., Colo., Wyo., Utah.

*Agapostemon coloradensis* Crawford, 1901. Nebr. Acad. Sci., Proc. 7: 163. ♀. Preocc. through secondary homonymy prior to 1961.

*Halictus Coloradinus* Vachal, 1903. Misc. Ent. 11: 90. N. name.

**tyleri** Cockerell. Ariz., N. Mex., Tex.; Mexico.

*Agapostemon tyleri* Cockerell, 1917. Ann. and Mag. Nat. Hist. (8) 20: 241. ♀, ♂.

*Agapostemon martini* Cockerell, 1927. Pan-Pacific Ent. 3: 153. ♀ (♂ misdet.).

**virescens** (Fabricius). Ont. and Maine to Fla., west to B. C., Wash. and Oreg. Predator:

*Philanthus gibbosus* (Fabr.), *P. solivagus* Say.

*Andrena virescens* Fabricius, 1775. Systema Ent., p. 378. ♀.

*Andrena nigricornis* Fabricius, 1793. Ent. System., v. 2, p. 313. ♂.

*Halictus dimidiatus* Lepeletier, 1841. Hist. Nat. Ins., Hym. v. 2, p. 283. ♀.

*Halictus tricolor* Lepeletier, 1841. Hist. Nat. Ins., Hym. v. 2, p. 389. ♂.

*Agapostemon bicolor* Robertson, 1893. Amer. Ent. Soc., Trans. 20: 148. ♀, ♂.

Taxonomy: Moure, 1960. Studia Ent. 3: 103-104 (synonymy, notes on type).

#### SPECIES GROUP MELLIVENTRIS

**melliventris** Cresson. Mont., Idaho, S. Dak., south to Tex., N. Mex., Ariz., and Calif.; Mexico.

Ecology: Nests in abandoned burrows and holes including vacated *Sceliphron* nests.

Predator: *Philanthus arizonicus* Bohart.

*Agapostemon melliventris* Cresson, 1874. Amer. Ent. Soc., Trans. 5: 101. ♀.

*Agapostemon fasciatus* Crawford, 1901. Nebr. Acad. Sci., Proc. 7: 163. ♀, ♂.

*Halictus (Agapostemon) plurifasciatus* Vachal, 1903. Misc. Ent. 11: 93, 101. ♀, ♂.

*Agapostemon digueti* Cockerell, 1924. Calif. Acad. Sci., Proc. (4) 12: 539. ♀, ♂.

**mexicanus** Roberts. Mexico (Baja California and Sonora). May occur in U. S. (vicinity of San Diego, Calif. or Yuma, Ariz.).

*Agapostemon mexicanus* Roberts, 1972. Kansas Univ. Sci. Bul. 49: 503. ♂, ♀.

**peninsularis** Roberts. Calif. (La Jolla and San Diego); Mexico (Baja California).

*Agapostemon peninsularis* Roberts, 1972. Kansas Univ. Sci. Bul. 49: 515. ♂, ♀.

#### SPECIES GROUP EREBUS

**leunculus** Vachal. Mexico to Colombia and Ecuador. May occur in U. S. since the species has been collected 10 miles southwest of Pharr, Texas in Mexico.

*Agapostemon leunculus* Vachal, 1903. Misc. Ent. 11: 92. ♀.

*Agapostemon vulpicolor* Crawford, 1906. Amer. Ent. Soc., Trans. 32: 162. ♀.

*Agapostemon nasutus* var. *ater* Friese, 1916. Stettin. Ent. Ztg. 77: 310. ♀.

#### SPECIES GROUP NASUTUS

**nasutus** Smith. Tex. (Brownsville), south to South America (Colombia, Ecuador, Peru and Venezuela) including Trinidad. Parasite: *Zodion americanum* Wied.

*Agapostemon nasutus* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 87. ♂.

*Agapostemon peruvianus* Cameron, 1903. Amer. Ent. Soc., Trans. 29: 237. ♂.

*Agapostemon nasutus gualanicus* Cockerell, 1912. Ann. and Mag. Nat. Hist. (8) 9: 556. ♂.

*Agapostemon purpureopictus* Cockerell, 1924. Calif. Acad. Sci., Proc. (4) 12: 538. ♀.

*Agapostemon melanurus* Cockerell, 1949. U. S. Natl. Mus., Proc. 98: 438. ♀.

Biology: Eickwort and Eickwort, 1969. Kansas Ent. Soc., Jour. 42: 421-452 (life history).

## Genus HALICTUS Latreille

Revision: Sandhouse, 1941. Ent. Amer. (n. s.) 21: 23-37. — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 332-338, figs. 82-83 (eastern U. S. spp.).

Biology: Wille and Michener, 1971. Biol. Trop., Rev. 18: 17-31 (Neotropical spp.).

Taxonomy: Roberts, 1973. Oreg. State Univ. Agr. Expt. Sta. Tech. Bul. 126: 1-23 (northwest. Amer. spp.).

## Genus HALICTUS Subgenus HALICTUS Latreille

*Halictus* Latreille, 1804. Nouv. Diet. Hist. Nat., v. 24, p. 182.

Type-species: *Apis quadricincta* Fabricius. Desig. by Richards, 1935.

*Odontalictus* Robertson, 1918. Ent. News 29: 91.

Type-species: *Halictus ligatus* Say. Monotypic and orig. desig.

*Monilapis* Cockerell, 1931. Ann. and Mag. Nat. Hist. (10) 7: 529.

Type-species: *Hylaeus tomentosus* Eversmann. Monotypic and orig. desig.

*farinosus* Smith. Mont., Nebr., and N. Mex., west to B. C. and Calif. Parasite: *Sphecodes arensiformis* Ckll. Predator: *Philanthus crabroniformis* Sm.

*Halictus farinosus* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 69. ♀.

*Halictus montanus* Crawford, 1902. Canad. Ent. 34: 234. ♀, ♂.

*Paranomia venabilesii* Ashmead, 1903. Canad. Ent. 35: 243. ♀.

*Halictus denticulus* Vachal, 1904. Soc. Sci. Hist. Arch. Correze, Bul. 26: 469. ♀, ♂.

*Halictus procerus* Vachal, 1904. Soc. Sci. Hist. Arch. Correze, Bul. 26: 469. ♂.

Taxonomy: Cockerell, 1905. Amer. Ent. Soc., Trans. 31: 350. ♀.

*ligatus* Say. North America south of about 50 degrees latitude, southward to the West Indies and Colombia. Parasite: *Nomada* sp., *Thecophora modesta* (Will.). Predator: *Philanthus albopilosus* Cress., *P. bilunatus* Cress., *P. gibbosus* (Fabr.), *P. lepidus* Cress., *P. pacificus arizonae* Dunn., *P. solivagus* Say, *P. ventilabris* Fabr.

*Halictus ligatus* Say, 1837. Boston Jour. Nat. Hist. 1: 396. ♀, ♂.

*Halictus poeyi* Lepeletier, 1841. Hist. Nat. Ins., Hym., v. 2, p. 271. ♂.

*Halictus capitosus* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 67. ♀.

*Halictus arnaticeps* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 250. ♀.

*Halictus texanus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 251. ♀, ♂.

*Halictus ornatipes* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 252. ♂.

*Halictus townsendi* Cockerell, 1896. Ann. and Mag. Nat. Hist. (6) 18: 293. ♀.

Biology: Rau, 1922. Acad. Sci. St. Louis, Trans. 24: 31. — Hicks, 1926. Colo. Univ., Studies 15: 217. — Knerer and Atwood, 1962. Ent. Soc. Ontario, Proc. 92: 160.

*parallelus* Say. Ont. and N. J. to Fla., west to Mont., N. Mex., and Tex.

*Halictus parallelus* Say, 1837. Boston Jour. Nat. Hist. 1: 397. ♀.

*Halictus occidentalis* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 250. ♀, ♂.

Biology: Packard, 1868. Amer. Nat. 1: 364. — Hungerford and Williams, 1912. Ent. News 23: 241.

*rubicundus* (Christ). Holarctic, in North America ranging from Alaska, B. C., N. W. T., and N. S., south to Calif., Ariz., Tex., and Fla. Parasite: *Nomada imbricata* Sm., *Sphecodes dichrous* Sm., *Zodion cinerium* (Fabr.). Predator: *Philanthus albopilosus* Cress., *P. crabroniformis* Sm., *P. solivagus* Say.

*Apis rubicunda* Christ, 1791. Naturges. Klassif. Nomencl. Ins. Bienen, Wespen,

*Ameisengeschlecht*...Hym., p. 190. ♀.

*Halictus lerouxii* Lepeletier, 1841. Hist. Nat. Ins., Hym., v. 2, p. 272. ♀.

*Halictus lerouxii* var. *ruborum* Cockerell, 1898. Canad. Ent. 30: 52. ♀.

*Halictus (Halictus) lerouxii* Lovell, 1908. Psyche 15: 34. Emend.

*Halictus lupinelli* Cockerell, 1936. Pan-Pacific Ent. 12: 158. ♀.

Taxonomy: Cockerell, 1937. Canad. Ent. 69: 88.

Biology: Hicks, 1926. Colo. Univ., Studies 15: 217. — Hicks, 1934. Colo. Univ., Studies 21: 265. — Knerer and Atwood, 1962. Ent. Soc. Ontario, Proc. 92: 162.

## Genus HALICTUS Subgenus SELADONIA Robertson

*Seladonia* Robertson, 1918. Ent. News 29: 91.

Type-species: *Apis seladonius* Fabricius. Orig. desig.

**confusus arapahonum** Cockerell. N. Dak. to N. Mex., west to B. C., Oreg., Calif. and Utah.

*Halictus arapahonum* Cockerell, 1906. Ann. and Mag. Nat. Hist. (7) 17: 316. ♀.

*Halictus provancheri nearcticus* Cockerell, 1911. Ann. and Mag. Nat. Hist. (8) 8: 661.

Preocc.

*Halictus (Chloralictus) olivarius* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (2532): 10. ♀.

Taxonomy: Michener, 1951. In Muesebeck, Krombein and Townes, U. S. Dept. Agr., Agr. Monog. 2: 1105 (synonymy).

**confusus confusus** Smith. Alaska, to N. S. south to Fla. west to N. Dak. and Tex. Predator:

*Philanthus albopilosus* Cress., *P. bilunatus* Cress., *P. crabroniformis* Sm., *P. gibbosus* (Fabr.), *P. pacificus arizonae* Dunn., *P. politus politus* Say, *P. pulcher* Dalla Torre, *P. solivagus* Say.

*Halictus confusus* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 70. ♀, ♂.

*Halictus constrictus* Provancher, 1882. Nat. Canad. 13: 202. ♀. Preocc.

*Halictus provancheri* Dalla Torre, 1896. Cat. Hym., v. 10, p. 77. N. name.

*Halictus nearcticus* Vachal, 1904. Soc. Sci. Hist. Arch. Correze, Bul. 26: 470. ♀, ♂.

Taxonomy: Cockerell, 1905. Amer. Ent. Soc. Trans. 31: 350. ♀. —Cockerell, 1911. Ann. and Mag. Nat. Hist. (8) 8: 660. —Michener, 1951. In Muesebeck, Krombein and Townes, U. S. Dept. Agr., Agr. Monog. 2: 1105 (synonymy).

Biology: Hicks, 1936. Canad. Ent. 68: 47. —Knerer and Atwood, 1962. Ent. Soc. Ontario, Proc. 92: 161.

**harmonius** Sandhouse. South. Calif.

*Halictus (Halictus) harmonius* Sandhouse, 1941. Ent. Amer. (n. s.) 21: 36. ♀.

**tripartitus** Cockerell. Idaho, Colo., and Tex. to Wash., Calif., Mexico (Baja California).

Predator: *Philanthus crabroniformis* Sm., *P. gibbosus* (Fabr.), *P. pacificus arizonae* Dunn., *P. pulcher* Dalla Torre.

*Halictus tripartitus* Cockerell, 1895. Ann. and Mag. Nat. Hist. (6) 16: 63. ♀.

*Halictus meliloti* Cockerell, 1895. Ann. and Mag. Nat. Hist. (6) 16: 67. ♀.

*Halictus catalinensis* Cockerell, 1903. South. Calif. Acad. Sci., Bul. 2: 84. ♀.

Taxonomy: Michener, 1953. Kansas Univ. Sci. Bul. 35: 1027, figs. 60, 61 (larva).

**virgatellus** Cockerell. N. W. T., B. C., Alta., Oreg., Colo., N. Mex.

*Halictus virgatellus* Cockerell, 1901. Psyche 9: 284. ♀.

*Halictus sansoni* Crawford, 1911. U. S. Natl. Mus., Proc. 41: 267. ♀.

*Halictus fraseræ* Cockerell, 1916. Entomologist 49: 100. ♀.

*Halictus typographicus* Cockerell, 1918. Entomologist 51: 261. ♂.

*Halictus (Seladonia) ororyctes* Cockerell, 1933. Ent. Soc. Amer., Ann. 26: 40. ♀.

Taxonomy: Cockerell, 1919. Ent. News 30: 288. ♂.

## NOMINA NUDA IN HALICTUS LATREILLE

*Halictus californica* Bridwell, 1899. Kans. Acad. Sci., Trans. 16: 210.

*Halictus emarginata* Smith, 1910. N. J. State Mus., Ann. Rpt. 1909, p. 688.

*Halictus fendleri* Clements and Long, 1923. Carnegie Inst. Wash., Pub. 336: 252.

*Halictus medionitens* Clements and Long, 1923. Carnegie Inst. Wash., Pub. 336: 252.

*Halictus missouriensis* Bridwell, 1899. Kans. Acad. Sci., Trans. 16: 210.

*Halictus pulzeus* Clements and Long, 1923. Carnegie Inst. Wash., Pub. 336: 252.

*Halictus rhopoides* Bray, 1917. Pomona Jour. Ent. Zool. 9: 99.

## Genus LASIOGLOSSUM Curtis

*Lasioglossum* Curtis, 1833. Brit. Ent. v. 10, p. 448.

Type-species: *Melitta xanthopus* Kirby. Monotypic and orig. desig. (= *Lasioglossum tricingulum* Curtis).

*Curtisapis* Robertson, 1918. Ent. News 29: 91.



Type-species: *Halictus coriaceus* Smith. Orig. desig.

*Pachyhalictus* Cockerell, 1929. Ann. and Mag. Nat. Hist. (10) 4: 589.

Type-species: *Halictus merescens* Cockerell. Orig. desig.

Revision: Sandhouse, 1933. Ent. Soc. Wash., Proc. 35: 80-83 (eastern U. S. spp.). — Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 338-347, figs. 81, 84-87 (eastern U. S. spp.).

*athabascense* (Sandhouse). N. S. to B. C., south to Wis., Mich., Ohio and in the eastern U. S. to N. C.

*Halictus athabascense* Sandhouse, 1933. Ent. Soc. Wash., Proc. 35: 78. ♂, ♀.

*bardum* (Cresson). Tex. to Calif.

*Halictus bardus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 251. ♀.

Taxonomy: Cockerell, 1897. Amer. Ent. Soc., Trans. 24: 163.

*citerior* (Vachal). No locality recorded.

*Halictus citerior* Vachal, 1904. Soc. Sci. Hist. Arch. Correze, Bul. 26: 473. ♀.

*coriaceum* (Smith). N. S. to Ga., west to Alta. and N. Mex. ranging southward in Mississippi

Valley to south. Ill. Predator: *Philanthus gibbosus* (Fabr.), *P. solivagus* Say.

*Halictus coriaceus* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 70. ♀.

*Halictus subquadratus* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 72. ♂.

*Halictus 6-cinctus* Provancher, 1882. Nat. Canad. 13: 200. ♂.

*Halictus sexcinctus* Dalla Torre, 1896. Cat. Hym., v. 10, p. 59. Emend.

*cyaneiceps* (Cockerell). N. Mex., Ariz.

*Halictus cyaneiceps* Cockerell, 1916. Canad. Ent. 48: 254. ♀, ♂.

*forbesii* (Robertson). N. B. west to Wash., south to Tex. and Ga. Predator: *Philanthus sanbornii* Cress.

*Halictus Forbesii* Robertson, 1890. Amer. Ent. Soc., Trans. 17: 315. ♀, ♂.

*Halictus forbesi* Cockerell, 1897. Amer. Ent. Soc., Trans. 24: 163. Emend.

Taxonomy: Cockerell, 1906. Amer. Ent. Soc., Trans. 32: 294.

Biology: Knerer and Atwood, 1962. Ent. Soc. Ontario, Proc. 92: 163.

*fuscipenne* (Smith). N. S. to Ontario, south to Tex. and Fla.

*Halictus fuscipennis* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 67. ♀, ♂.

*Halictus capitulatus* Vachal, 1904. Soc. Sci. Hist. Arch. Correze, Bul. 26: 472. ♀.

*heterorhinum* (Cockerell). Colo., Ariz.

*Halictus heterorhinus* Cockerell, 1930. Amer. Mus. Novitates 397: 6. ♀.

*leucozonium* (Schränk). Holarctic, widespread in Europe and Canada; Maine, N. Y. Predator:

*Philanthus albopilosus* Cress., *P. bilunatus* Cress., *P. solivagus* Say.

*Apis leucozonis* Schrank, 1781. Enum. Ins. Austr., p. 406.

*Halictus similis* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 69. ♀.

Taxonomy: Cockerell, 1905. Amer. Ent. Soc., Trans. 31: 352.

Biology: Atwood, 1933. Canad. Jour. Res. 9: 449. —Knerer and Atwood, 1962. Ent. Soc. Ontario, Proc. 92: 163.

*monitouellum* (Cockerell). Colo.

*Halictus monitouellus* Cockerell, 1908. Ent. Soc. Wash., Proc. 9: 119. ♀.

*mellipes* (Crawford). Calif.; Mexico (Baja California).

*Halictus mellipes* Crawford, 1907. Invertebrata Pacifica 19: 190. ♀.

*olympiae* (Cockerell). B. C., Wash., Oreg., Calif.,? Colo.

*Halictus olympiae* Cockerell, 1898. Canad. Ent. 30: 51. ♀.

*Halictus olympiae* var. *subangustus* Cockerell, 1898. Canad. Ent. 30: 51. ♀.

*Halictus olympiae* var. *subangustatus* Crawford, 1906. Canad. Ent. 38: 301. Error for *subangustus*.

Taxonomy: Vachal, 1904. Soc. Sci. Hist. Arch. Correze, Bul. 26: 476. ♂ ?

*pacificum* (Cockerell). B. C., Wash., Calif.

*Halictus pacificus* Cockerell, 1898. Acad. Nat. Sci. Phila., Proc. 50: 50. ♀, ♂.

*pavonotum* (Cockerell). Calif.

*Halictus pavonotus* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 188. ♀, ♂.

**ripariellum** (Cockerell). Colo.*Halictus ripariellus* Cockerell, 1918. Entomologist 51: 261. ♀.**sisymbrii** (Cockerell). Wyo. to N. Mex., west to B. C. and Calif.; Mexico (Baja California).Predator: *Philanthus ventilabris* Fabr.*Halictus sisymbrii* Cockerell, 1895. Ann. and Mag. Nat. Hist. (6) 16: 63. ♀.

Taxonomy: Cockerell, 1897. Amer. Ent. Soc., Trans. 25: 165. ♀, ♂.

Biology: Linsley, 1962. Ent. Soc. Amer., Ann. 55: 159. —Alcock and Gamboa, 1975. Ariz.

Acad. Sci. 10: 163 (predator).

**titusi** (Crawford). Oreg., Calif.*Halictus Titusi* Crawford, 1902. Canad. Ent. 34: 235. ♀.**trizonatum** (Cresson). Alta. to N. Mex., west to B. C. and Calif.*Halictus trizonatus* Cresson, 1874. Amer. Ent. Soc., Trans. 5: 101. ♀.*Halictus egregius* Vachal, 1904. Soc. Sci. Hist. Arch. Correzze, Bul. 26: 476. ♀.*Halictus colatus* Vachal, 1904. Soc. Sci. Hist. Arch. Correzze, Bul. 26: 476. ♂.**zonulum** (Smith). Holartic; N. S. to Minn., south to N. Y., Mich., Wis. Predator: *Philanthus gibbosus* (Fabr.).*Halictus zonulus* Smith, 1848. Zoologist 6: 2171. ♀, ♂.*Halictus craterus* Lovell, 1908. Psyche 15: 35. ♀, ♂.

Biology: Brittain, 1933. Canad. Dept. Agr., Bul. (n. s.) 162: 94. —Knerer and Atwood, 1962.

Ent. Soc. Ontario, Proc. 92: 163.

**Genus EVYLAEUS Robertson***Evylaeus* Robertson, 1902. Canad. Ent. 34: 244.Type-species: *Halictus arcuatus* Robertson. Orig. desig. (= *Halictus cinctipes* Provancher).

Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 348-363, figs. 89-91 (eastern U. S. spp.).

Biology: Knerer and Plateaux, 1967. Acad. Sci. Paris, Compt. Rend. 265: 455-458 (nest architecture).

**aberrans** (Crawford). N. Dak., Nebr., Colo., N. Mex., Alta., Oreg., Calif., Utah. Parasite:*Sphécodes* sp. Pollen: Collects pollen principally from *Oenothera*, but also visits these and a wide variety of other plants for nectar or occasionally pollen. Predator:*Philanthus gibbosus* (Fabr.).*Halictus aberrans* Crawford, 1903. Canad. Ent. 35: 336. ♀.*Halictus galpinsiae* Cockerell, 1903. Canad. Ent. 35: 342. ♀.*Halictus gelidus* Vachal, 1904. Soc. Sci. Hist. Arch. Correzze, Bul. 26: 481. ♂.Biology: Bohart and Youssef, 1977 (1976). Wasmann Jour. Biol. 34: 185-234, 18 figs., 4 tables (nest architecture, life history, behavior, parasite, as *galpinsiae*).**absurdiceps** (Timberlake). Calif. (Central Valley).*Halictus (Evylaeus) absurdiceps* Timberlake, 1962. Ent. Soc. Wash., Proc. 62: 105. ♂.**allonotus** (Cockerell). Calif.*Halictus allonotus* Cockerell, 1936. Pan-Pacific Ent. 12: 156. ♀.**amicus** (Cockerell). N. Mex., Ariz., Calif.*Halictus amicus* Cockerell, 1897. Amer. Ent. Soc., Trans. 24: 164. ♀.**angustior** (Cockerell). N. Mex., Ariz.*Halictus angustior* Cockerell, 1897. Amer. Ent. Soc., Trans. 24: 165, 167. ♀, ♂.**argemonis** (Cockerell). Calif.; Mexico.*Halictus arcuatus* var. *argemonis* Cockerell, 1897. Amer. Ent. Soc., Trans. 24: 146. ♀.*Halictus latifrons* Crawford, 1907. Invertebrata Pacifica 1: 192. ♀.

Taxonomy: Michener, 1951. In Muesebeck, Krombein and Townes, U. S. Dept. Agr., Agr. Monog. 2: 1107 (synonymy).

**arizonensis** (Crawford). Ariz., Calif.; Mexico (Baja California).*Halictus arizonensis* Crawford, 1907. N. Y. Ent. Soc., Jour. 15: 189. ♀.

**aspilurus** (Cockerell). Calif.*Halictus aspilurus* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 190. ♀.**avalonensis** (Cockerell). Calif.*Halictus avalonensis* Cockerell, 1938. Ann. and Mag. Nat. Hist. (11) 2: 150. ♀.

Taxonomy: Cockerell, 1939. Calif. Acad. Sci., Proc. (4) 23: 435. ♂.

**birkmanni** (Crawford). Tex.*Halictus Birkmanni* Crawford, 1906. Canad. Ent. 38: 5. ♀.**bradleyi** Mitchell. N. J. (Pitman). This may be the male of *Evyllaes pectinatus* (Robertson).*Evyllaes bradleyi* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 356, figs. 88, 91. ♂.**cinctipes** (Provancher). N. S. to Fla., west to N. Dak. and Colo.*Halictus cinctipes* Provancher, 1888. Addit. Corr. Faune Ent. Canada, Hym., p. 316. ♂.*Halictus arcuatus* Robertson, 1893. Amer. Ent. Soc., Trans. 20: 145. ♀.*Halictus crassus* Vachal, 1904. Soc. Sci. Hist. Arch. Correze, Bul. 26: 477. ♀.*Halictus adelipus* Vachal, 1904. Soc. Sci. Hist. Arch. Correze, Bul. 26: 479. ♂.*Halictus arcuatus* var. *parisus* Lovell, 1908. Psyche 15: 36. ♀.*Halictus arcuatus gulosus* Cockerell, 1911. Ann. and Mag. Nat. Hist. (8) 8: 661. ♀.*Halictus gulosus punctiferus* Cockerell, 1916. Ann. and Mag. Nat. Hist. (8) 17: 286. ♀.

Taxonomy: Knerer and Atwood, 1964. Canad. Ent. 96: 960-962, fig. 1.

Biology: Brittain, 1933. Canad. Dept. Agr., Bul. (n. s.) 162: 94. —Atwood, 1933. Canad. Jour.

Res. 9: 448. —Knerer and Atwood, 1964. Canad. Ent. 96: 960-962, fig. 1. —Knerer and

Plateaux-Quenu, 1966. Acad. Sci. Paris, Compt. Rend. 263: 1622-1625 (nests).

**comagensis** Knerer and Atwood. Ont., Alaska.*Evyllaes comagensis* Knerer and Atwood, 1964. Canad. Ent. 96: 959, fig. 1. ♀, ♂.**cooleyi** (Crawford). Alta., B. C., Mont., Colo., N. Mex., Tex., Oreg., Calif. Predator: *Philanthus**crabroniformis* Sm.*Halictus cooleyi* Crawford, 1906. In Viereck, Canad. Ent. 38: 301. ♀, ♂.**cordleyi** (Crawford). B. C., Oreg., Calif.*Halictus Cordleyi* Crawford, 1906. In Viereck, Canad. Ent. 38: 302. ♀, ♂.**dasiphorae** (Cockerell). N. Mex., Calif.*Halictus dasiphorae* Cockerell, 1901. Psyche 9: 285. ♀.**diatretus** (Vachal). B. C., Wash., Nev., Colo.,? Oreg.*Halictus diatretus* Vachal, 1904. Soc. Sci. Hist. Arch. Correze, Bul. 26: 481. ♀, ♂.**divergenoides** Mitchell. Mich., Ind. Predator: *Philanthus lepidus* Cress.*Evyllaes divergenoides* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 351, fig. 91. ♂.**divergens** (Lovell). N. S. to Minn., south to Ga.*Halictus divergens* Lovell, 1905. Canad. Ent. 37: 299. ♀.

Taxonomy: Knerer and Atwood, 1964. Canad. Ent. 96: 958, fig. 1. ♂.

**fartus** (Vachal). Wash.*Halictus fartus* Vachal, 1904. Soc. Sci. Hist. Arch. Correze, Bul. 26: 483. ♀.**fedorensis** (Crawford). Tex.*Halictus Fedorensis* Crawford, 1906. Canad. Ent. 38: 4. ♀.**foxii** (Robertson). N. S. to Man. and Minn., south to Ga.*Halictus gracilis* Robertson, 1890. Amer. Ent. Soc., Trans. 17: 316. ♀, ♂. Preocc.*Halictus foxii* Robertson, 1895. Amer. Ent. Soc., Trans. 22: 117. N. name.*Halictus gracillimus* Dalla Torre, 1896. Cat. Hym., v. 10, p. 63. N. name.

Biology: Knerer and Atwood, 1962. Ent. Soc. Ontario, Proc. 92: 164.

**giffardi** (Michener). Calif.*Halictus giffardi* Michener, 1937. Ann. and Mag. Nat. Hist. (10) 19: 315. ♀.**glabriventris** (Crawford). Oreg., Calif., Colo.*Halictus Vachali* Crawford, 1906. In Viereck, Canad. Ent. 38: 300. ♀. Preocc.*Halictus glabriventris* Crawford, 1907. Canad. Ent. 39: 21. N. name.

Biology: Hicks, 1936. Canad. Ent. 68: 47.

**granosus** (Vachal). Colo.

*Halictus granosus* Vachal, 1904. Soc. Sci. Hist. Arch. Correze, Bul. 26: 477. ♀, ♂.

**gularis** (Vachal). Calif.

*Halictus gularis* Vachal, 1904. Soc. Sci. Hist. Arch. Correze, Bul. 26: 481. ♂.

**hammondi** (Cockerell). Calif.

*Halictus hammondi* Cockerell, 1938. Ann. and Mag. Nat. Hist. (11) 2: 149. ♀.

**humboldtensis** (Michener). Calif.

*Halictus (Evyllaesus) humboldtensis* Michener, 1936. Pan-Pacific Ent. 12: 166. ♀.

**inconditus** (Cockerell). Alaska, Wash., Colo.

*Halictus inconditus* Cockerell, 1916. Entomologist 49: 101. ♀.

**kincaidii** (Cockerell). Wash., Oreg., Calif.

*Halictus kincaidii* Cockerell, 1898. Canad. Ent. 30: 51. ♀.

Taxonomy: Cockerell, 1903. Entomologist 36: 208. — Michener, 1937. Ann. and Mag. Nat. Hist. (10) 19: 318. ♂, ♀. — Michener, 1953. Kansas Univ. Sci. Bul. 35: 1025, figs. 48-53 (larva).

**lusorius** (Cresson). Tex., N. Mex.

*Halictus lusorius* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 252. ♀.

Taxonomy: Cockerell, 1897. Amer. Ent. Soc., Trans. 24: 166. — Linsley and MacSwain, 1962. Pan-Pacific Ent. 38: 45.

**macoupinensis** (Robertson). Minn. to N. B., south to Ga. and Ala.

*Halictus 4-maculatus* Robertson, 1890. Amer. Ent. Soc., Trans. 17: 316. ♀, ♂. Preocc.

*Halictus quadrimaculatus* Cockerell, 1895. Ann. and Mag. Nat. Hist. (6) 16: 65. Emend.

*Halictus macoupinensis* Robertson, 1895. Amer. Ent. Soc., Trans. 22: 117. N. name.

**mendocinensis** (Michener). Calif.; Mexico (Baja California).

*Halictus (Evyllaesus) mendocinensis* Michener, 1936. Pan-Pacific Ent. 12: 167. ♀.

**miguelensis** (Cockerell). Calif.; Mexico (Baja California).

*Halictus miguelensis* Cockerell, 1937. Pan-Pacific Ent. 13: 156. ♂.

*Halictus cooleyi obscurior* Cockerell, 1939. Calif. Acad. Sci., Proc. (4) 23: 435. ♀, ♂. Preocc.

**nelumbonis** (Robertson). Maine to Minn., south to Fla. and Tex.

*Halictus nelumbonis* Robertson, 1890. Amer. Ent. Soc., Trans. 17: 316. ♀, ♂.

**nigrescens** (Crawford). Calif.; Mexico (Baja California).

*Halictus nigrescens* Crawford, 1907. Invertebrata Pacifica 1: 191. ♀.

Taxonomy: Cockerell, 1936. Pan-Pacific Ent. 12: 159. ♀.

**nigricollis** (Vachal). Colo.

*Halictus nigricollis* Vachal, 1904. Soc. Sci. Hist. Arch. Correze, Bul. 26: 480. ♂.

**nigridens** (Vachal). Calif.

*Halictus nigridens* Vachal, 1904. Soc. Sci. Hist. Arch. Correze, Bul. 26: 480. ♂.

**niger** (Viereck). Labrador, N. S., N. Y., Alta., B. C., south in mountains to N. Mex.; Eurasia.

Predator: *Philanthus crabroniformis* Sm., *P. pacificus arizonae* Dunn., *P. pulcher* Dalla Torre.

*Halictus niger* Viereck, 1903. Amer. Ent. Soc., Trans. 29: 56. ♀, ♂.

*Halictus fratellus* Perez, 1903. Soc. Linn. de Bordeaux, Actes 58: ccxiv. ♀.

*Halictus frey-gessneri* Alfken, 1905. Nat. Ver. Bremen, Abh. 18: 73. ♀, ♂.

Taxonomy: Eidman, 1935. Arb. ueber Morph. u. Taxonom. Ent. 2: 104.

**occultus** (Vachal). Wash.

*Halictus occultus* Vachal, 1904. Soc. Sci. Hist. Arch. Correze, Bul. 26: 478. ♀.

**oenotherae** (Stevens). N. S. south to Ga., west to N. Dak. and Kans. Pollen: Oligolege of

*Oenothera*. *Evyllaesus pineolensis* Mitchell is possibly the male of this species.

*Halictus (Evyllaesus) oenotherae* Stevens, 1920. Ent. News 31: 37. ♀.

*Halictus ralenci* Crawford, 1932. Ent. Soc. Wash., Proc. 34: 70. ♀.

Taxonomy: Linsley and MacSwain, 1962. Pan-Pacific Ent. 38: 45. — Knerer and Atwood, 1964. Canad. Ent. 96: 958-959 (geogr. and floral records).

- Biology: Knerer and MacKay, 1969. *Canad. Jour. Zool.* 47: 289-294 (nest architecture, life history).
- orthocarp** (Cockerell). Calif.  
*Halictus orthocarp* Cockerell, 1936. *Pan-Pacific Ent.* 12: 159. ♀
- Taxonomy: Michener, 1936. *Pan-Pacific Ent.* 12: 171. ♂.
- ovaliceps** (Cockerell). Colo., N. Mex., B. C., Calif.  
*Halictus ovaliceps* Cockerell, 1898. *Denison Univ. Sci. Labs., Bul.* 11: 45. ♀. Republished by Cockerell, 1898. *N. Mex. Univ., Bul.* 1: 45. female.
- Taxonomy: Michener, 1937. *Ann. and Mag. Nat. Hist.* (10) 19: 317. ♂.
- Biology: Hicks, 1936. *Canad. Ent.* 68: 47.
- pecosensis** (Crawford). N. Mex.  
*Halictus Pecosensis* Crawford, 1906. *Canad. Ent.* 38: 6. ♀.
- pectinatus** (Robertson). Conn., N. J., Md., Ill., Mo.  
*Halictus pectinatus* Robertson, 1890. *Amer. Ent. Soc., Trans.* 17: 315. ♀.
- pectoralis** (Smith). N. S. to Fla., west to Wis., Nebr., Tex.  
*Halictus pectoralis* Smith, 1853. *Cat. Hym. Brit. Mus.*, v. 1, p. 68. ♀.
- Taxonomy: Cockerell, 1895. *Ann. and Mag. Nat. Hist.* (6) 16: 64. — Robertson, 1898. *Acad. Sci. St. Louis, Trans.* 8: 44. ♂. — Cockerell, 1905. *Amer. Ent. Soc., Trans.* 31: 350. ♀.
- pectoraloides** (Cockerell). Man., B. C., Colo., N. Mex., Ariz., Calif.; north Mexico.  
*Halictus pectoraloides* Cockerell, 1895. *Ann. and Mag. Nat. Hist.* (6) 16: 64. ♀.  
*Halictus pectoraloides* var. *beatulus* Cockerell, 1918. *Entomologist* 51: 262. ♀.  
*Halictus (Evyllaenus) grindeliae* Cockerell, 1934. *Ent. News* 45: 29. ♀.
- Taxonomy: Cockerell, 1897. *Amer. Ent. Soc., Trans.* 24: 166. ♀, ♂.
- peralpinus** (Cockerell). Colo.  
*Halictus peralpinus* Cockerell, 1919. *Ent. News* 30: 289. ♀.
- peraltus** (Cockerell). Wash., Wyo., Colo., N. Mex., Calif. Predator: *Philanthus crabroniformis* Sm.  
*Halictus peraltus* Cockerell, 1901. *Psyche* 9: 164. ♂.
- pineolensis** Mitchell. N. C. (Pineola). Possibly male of *Evyllaenus oenotherae* (Stevens).  
*Evyllaenus pineolensis* Mitchell, 1960. *N. C. Agr. Expt. Sta. Tech. Bul.* 141: 358. ♂.
- pullilabris** (Vachal). Calif.  
*Halictus pullilabris* Vachal, 1904. *Soc. Sci. Hist. Arch. Correze, Bul.* 26: 479. ♂.
- Biology: MacSwain, Raven and Thorp, 1973. *Calif. Univ., Pubs. Ent.* 70: 37-40 (flower relationships).
- pulveris** (Cockerell). Colo.  
*Halictus pulveris* Cockerell, 1930. *Amer. Mus. Novitates* 397: 7. ♀, ♂.
- quebecensis** (Crawford). Minn. to Newfoundland, south to Ga.  
*Halictus quebecensis* Crawford, 1907. *N. Y. Ent. Soc., Jour.* 15: 189. ♀.
- regis** (Cockerell). Colo.  
*Halictus regis* Cockerell, 1916. *Entomologist* 49: 102. ♀.
- robertsoni** (Crawford). Tex.  
*Halictus Robertsoni* Crawford, 1906. *Canad. Ent.* 38: 4. ♀.
- robustus** (Crawford). Calif.  
*Halictus robustus* Crawford, 1907. *Invertebrata Pacifica* 1: 191. ♀.
- ruficornis** (Crawford). Nev., Calif., Ariz.  
*Halictus ruficornis* Crawford, 1907. *Invertebrata Pacifica* 1: 192. ♂.
- rufitarsis** (Zetterstedt). Holarctic; Alaska, N. S., N. B., Ont., Mich.  
*Halictus rufitarsis* Zetterstedt, 1838. *Ins. Lappon.*, v. 1, p. 462. ♀, ♂.  
*Hylaeus minutissimus* Eversmann, 1852. *Soc. Nat. Moscou, Bul.* 25: 42. ♂.  
*Halictus atricornis* Smith, 1870. *Ent. Ann.*, p. 26. ♀, ♂.
- Taxonomy: Eidmann, 1935. *Arb. ueber Morph. u. Taxonom. Ent.* 2: 104.

**sanfranciscoensis** (Strand). Ariz.

*Halictus sanfranciscoensis* Strand, 1917. Arch. f. Naturgesch. 83 (Abt. A, Heft 11): 57. ♂.

**sequoiae** (Michener). Calif.

*Halictus (Evyllaenus) sequoiae* Michener, 1936. Pan-Pacific Ent. 12: 165. ♀.

**sopinci** (Crawford). N. J., N. C., Ga.

*Halictus sopinci* Crawford, 1932. Ent. Soc. Wash., Proc. 34: 69. ♀.

**subobscurus** (Cockerell). N. Mex.

*Halictus subobscurus* Cockerell, 1895. Ann. and Mag. Nat. Hist. (6) 16: 65. ♀.

*Halictus Cockerelli* Crawford, 1902. Canad. Ent. 34: 236. ♀.

**supranitens** (Cockerell). Colo.

*Halictus supranitens* Cockerell, 1919. Ent. News 30: 289. ♀.

**swenki** (Crawford). N. Dak., Nebr.

*Halictus swenki* Crawford, 1906. Ent. News 17: 275. ♀.

**synthyridis** (Cockerell). Alta., Colo. Predator: *Philanthus crabroniformis* Sm., *P. pacificus arizonae* Dunn.

*Halictus synthyridis* Cockerell, 1906. Amer. Mus. Nat. Hist., Bul. 22: 427. ♀, ♂.

**tracyi** (Cockerell). Calif.

*Halictus tracyi* Cockerell, 1936. Pan-Pacific Ent. 12: 161. ♀.

Taxonomy: Michener, 1936. Pan-Pacific Ent. 12: 170. ♀, ♂.

**truncatus** (Robertson). Que. and Maine to Ga., west to Kans., Nebr., and Wash.

*Halictus truncatus* Robertson, 1901. Canad. Ent. 33: 230. ♀, ♂.

*Halictus fulgidus* Crawford, 1902. Canad. Ent. 34: 235. ♀.

Taxonomy: Knerer and Atwood, 1964. Canad. Ent. 96: 962, fig. 1.

**vaporellus** (Cockerell). Colo.

*Halictus vaporellus* Cockerell, 1910. Canad. Ent. 42: 366. ♀.

#### Genus HEMIHALICTUS Cockerell

*Hemihalictus* Cockerell, 1897. Canad. Ent. 29: 288.

Type-species: *Panurgus lustrans* Cockerell. Monotypic.

**lustrans** (Cockerell). Va. to Fla., Ind. and Mich. to Miss. and Tex. Pollen: Oligolege of *Pyrrhopappus carolinianus*, but occasionally visits other flowers including *Cichorium intybus* and *Cucurbita* presumably for nectar; males also obtain nearly their entire nectar supply from the flowers of *Pyrrhopappus carolinianus*.

*Panurgus lustrans* Cockerell, 1897. Amer. Ent. Soc., Trans. 24: 147. ♀.

Taxonomy: Michener, 1947. N. Y. Ent. Soc., Jour. 55: 50. ♂. — Mitchell, 1960. N. C. Agr.

Expt. Sta. Tech. Bul., 141: 363-364, fig. 81.

Biology: Michener, 1947. N. Y. Ent. Soc., Jour. 55: 50. — Daly, 1961. Kans. Ent. Soc., Jour. 34: 134-140, 13 figs. (biology and taxonomy).

#### Genus SPHECODOGASTRA Ashmead

*Sphecodogastra* Ashmead, 1899. Amer. Ent. Soc., Trans. 26: 92.

Type-species: *Parasphcodes texana* Cresson. Monotypic and orig. desig.

Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 364-366. — Linsley and MacSwain, 1962. Pan-Pacific Ent. 38: 45.

Biology: Stevens, 1920. Ent. News 31: 39-44.

**noctivaga** (Linsley and MacSwain). Utah, N. Mex., west Tex. Pollen: Collects pollen from flowers of *Oenothera hartwegii*, but visits flowers of other plants for nectar.

*Lasioglossum (Sphecodogastra) noctivaga* Linsley and MacSwain, 1962. Pan-Pacific Ent. 38: 46. ♀.

**texana** (Cresson). N. Dak. and Mich., south to Tex., N. Mex. and Mexico, west to Colo., east to Ind. Pollen: Oligolege of *Oenothera* including *O. caespitosa*, *O. rhombipetala*, *O. runcinata*, but visits the flowers of other plants for nectar.

*Parasphcodes texanus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 249. ♀.

Biology: Graenicher, 1911. Pub. Mus. Milwaukee, Bul. 1: 222-225. —Stevens, 1920. Ent. News 31: 39. —Hicks, 1936. Canad. Ent. 68: 51. —Chandler, 1962. Ind. Acad. Sci., Proc. for 1961, 71: 124-129, 2 figs., 2 tables. —Kerfoot, 1967. Kansas Ent. Soc., Jour. 40: 84-93, 9 figs., 2 tables (nest architecture, behavior). —Kerfoot, 1967. Anim. Behavior 15: 479-486 (lunar periodicity).

### Genus DIALICTUS Robertson

*Dialictus* Robertson, 1902. Canad. Ent. 34: 48.

Type-species: *Halictus anomalus* Robertson. Monotypic and orig. desig.

*Chloralictus* Robertson, 1902. Canad. Ent. 34: 248.

Type-species: *Halictus cressoni* Robertson. Orig. desig.

*Halictus* subg. *Gastrohalictus* Ducke, 1902. Ztschr. System. Hym. Dipt. 2: 102.

Type-species: *Halictus osmioides* Ducke. Monotypic.

*Halictomorpha* Schrottky, 1911. Rev. Mus. Paulista 8: 81.

Type-species: *Halictomorpha phaedra* Schrottky. Monotypic and orig. desig.

Revision: Sandhouse, 1923. Canad. Ent. 55: 193. —Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 1-10. —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 368-445, figs. 95-102, tables 11-12 (eastern U. S. spp.).

**abanci** (Crawford). Minn. to N. B., south to Ga.

*Halictus abanci* Crawford, 1932. Ent. Soc. Wash., Proc. 34: 71. ♀.

**abietus** (Michener). Colo.

*Halictus (Chloralictus) abietum* Michener, 1938. Ann. and Mag. Nat. Hist. (10) 18: 281. ♀, ♂.

**absimilis** (Sandhouse). Colo.

*Halictus absimilis* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 21. ♀.

**abundus** (Sandhouse). N. Mex.

*Halictus abundus* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 32. ♂.

**academicus** (Sandhouse). Iowa, Colo.

*Halictus academicus* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 12. ♀.

*Halictus vintonensis* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 22. ♀.

Taxonomy: Michener, 1951. In Muesebeck, Krombein and Townes, U. S. Dept. Agr., Agr. Monog. 2: 1111 (synonymy).

**accentus** (Sandhouse). Colo.

*Halictus accentus* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 38. ♂.

**achilleae** Mitchell. Mass. to N. C., Mich.

*Dialictus achilleae* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 377. ♀.

**actinosus** (Sandhouse). Calif.

*Halictus actinosus* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 13. ♀.

**actuarius** (Sandhouse). Colo.

*Halictus actuarius* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 25. ♂.

**admirandus** (Sandhouse). Minn. to N. S., south to La. and Fla.

*Halictus admirandus* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 14. ♀.

**advertus** Mitchell. Mass. (Reading).

*Dialictus advertus* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 433, fig. 102. ♂.

**alachuensis** Mitchell. Ga., Fla.

*Dialictus alachuensis* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 378. ♀.

**albipennis** (Robertson). N. S. to Oreg., south to N. C., Ill., and Colo. Predator: *Philaanthus politus politus* Say.

*Halictus albipennis* Robertson, 1890. Amer. Ent. Soc., Trans. 17: 317. ♀, ♂.

*Halictus nubilus* Lovell, 1905. Canad. Ent. 37: 40. ♀.

**albitarsis** (Cresson). Tex.,? Ont.

*Halictus albitarsis* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 254. ♂.

Taxonomy: Warneke, 1973. Soc. Royale Sci. Liege 42 (7-8): 294 (proposed replacement name).

**albohirtus** (Crawford). Nev.

*Halictus albohirtus* Crawford, 1907. Invertebrata Pacifica 1: 193. ♀.

**albuquerqueensis** (Michener). N. Mex.

*Halictus (Chloralictus) albuquerqueensis* Michener, 1937. Ann. and Mag. Nat. Hist. (10) 19: 316. ♀.

**alius** (Sandhouse). N. Mex., Ariz.

*Halictus alius* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 16. ♀.

**alternatus** Mitchell. Ont. and Mass. to Va., Ohio, Mich.

*Dialictus alternatus* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 433. ♂.

**anomalus** (Robertson). Alta. and Colo. east to N. S. south to Ala. and Ga.

*Halictus anomalus* Robertson, 1892. Amer. Nat. 26: 272. ♀.

**apertus** (Sandhouse). Minn. to Maine, south to La. and Ga. Predator: *Philanthus lepidus* Cress.

*Halictus apertus* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 35. ♂.

**apocyni** Mitchell. W. Va., Ohio, Ind., Tenn.

*Dialictus apocyni* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 381. ♀.

**apokpensis** (Robertson). N. C. to Fla., Miss.

*Halictus apokpensis* Robertson, 1892. Amer. Nat. 26: 272. ♀.

**aquilae** (Cockerell). N. Mex.; north. Mexico.

*Halictus aquilae* Cockerell, 1898. Ann. and Mag. Nat. Hist. (7) 2: 450. ♀.

Taxonomy: Cockerell, 1900. Ann. and Mag. Nat. Hist. (7) 5: 415. ♂.

**arcanus** (Sandhouse). N. Mex.

*Halictus arcanus* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 19. ♀.

**astutus** (Sandhouse). N. Mex.

*Halictus astutus* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 31. ♂.

**atlanticus** Mitchell. Ont., Mass., N. Y., W. Va., N. C.

*Dialictus atlanticus* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 383. fig. 99. ♀.

Taxonomy: Knerer and Atwood, 1966. Canad. Ent. 98: 881. ♂.

**atriventris** (Crawford). Alta., B. C.

*Halictus atriventris* Crawford, 1906. In Viereck, Canad. Ent. 38: 303. ♀, ♂.

**basilicus** (Sandhouse). Minn. to Conn., N. H., Ont.

*Halictus basilicus* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 36. ♂.

Taxonomy: Knerer and Atwood, 1966. Canad. Ent. 98: 881. ♀.

**bernardinensis** (Michener). Calif.

*Halictus (Chloralictus) bernardinensis* Michener, 1936. Ann. and Mag. Nat. Hist. (10) 18: 286. ♀.

**brassicae** Mitchell. N. C., Fla.

*Dialictus brassicae* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 384. ♀.

**brevibasis** (Cockerell). Sask.

*Halictus (Chloralictus) brevibasis* Cockerell, 1938. Amer. Mus. Novitates 983: 3. ♂.

**bruneri** (Crawford). Ont. and N. Y. to Fla., west to Nebr.

*Halictus Bruneri* Crawford, 1902. Canad. Ent. 34: 237. ♀.

*Halictus brimleyi* Crawford, 1932. Ent. Soc. Wash., Proc. 34: 71. ♀.

**brunneiventris** (Crawford). Nev., Calif.

*Halictus brunneiventris* Crawford, 1907. Invertebrata Pacifica 1: 194. ♀.

**cabrilli** (Cockerell). Calif. (San Miguel Island).

*Halictus (Chloralictus) cabrilli* Cockerell, 1937. Pan-Pacific Ent. 13: 155. ♂.

**caducus** (Sandhouse). N. Mex.

*Halictus caducus* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 17. ♀.

**californiae** (Ellis). Calif.

*Halictus perpunctatus* var. *californiae* Ellis, 1924. U. S. Natl. Mus., Proc. 65 (19): 6. ♀.

*Lasioglossum (Chloralictus) californiae*(!) Michener, 1951. In Muesebeck, Krombein and Townes, U. S. Dept. Agr., Agr. Monog. 2: 1112. *Lapsus calami*.

Taxonomy: Timberlake, 1940. South. Calif. Acad. Sci., Bul. 39: 190. ♀, ♂.



- callidus** (Sandhouse). Ill. and Mich. to New England, south to N. C.  
*Halictus callidus* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 34. ♂.
- cattellae** (Ellis). Ohio, Que., New England, south to Ga.  
*Halictus cattellae* Ellis, 1913. Ent. News 24: 209. ♀, ♂.
- ceanothi** Mitchell. N. C., Mich., Mo.  
*Dialictus ceanothi* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 386, fig. 99. ♀.
- clarissimus** (Ellis). N. Mex., Ariz.  
*Halictus clarissimus* Ellis, 1914. N. Y. Ent. Soc., Jour. 22: 222. ♀.
- clematisellus** (Cockerell). N. Mex., Ariz., Calif., Utah. Predator: *Philanthus multimaculatus* Cam.  
*Halictus clematisellus* Cockerell, 1904. Canad. Ent. 36: 13. ♀.  
 Taxonomy: Cockerell, 1904. Entomologist 39: 6. ♂, ♀.
- coactus** (Cresson). Tex.  
*Halictus coactus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 254. ♀.
- coeruleus** (Robertson). Minn. to Mass., south to Ga. Ecology: Nests in decomposed wood, but has been induced to nest in the soil.  
*Halictus coeruleus* Robertson, 1893. Amer. Ent. Soc., Trans. 20: 146. ♀, ♂.  
 Biology: Knerer and Atwood, 1962. Ent. Soc. Ontario, Proc. 92: 167. —Stockhammer, 1967. Kansas Ent. Soc., Jour. 40: 177-189 (life history). —Barrows, 1973. Kansas Ent. Soc., Jour. 46: 496-499 (induced soil nesting experimentation).
- comulus** (Michener). N. Mex.  
*Halictus comis* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 18. ♀. Preocc. by Vachal, 1911.  
*Lasioglossum (Chloralictus) comulum* Michener, 1951. In Muesebeck, Krombein, Townes, U. S. Dept. Agr., Agr. Monog. 2: 1113. N. name.
- connexus** (Cresson). Wis., Tex.  
*Halictus connexus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 253. ♀.
- coreopsis** (Robertson). Ill. and Mich. to Mass., south to Fla.  
*Halictus longiceps* Robertson, 1892. Amer. Nat. 26: 272. ♀. Preocc. by Saunders, 1879.  
*Chloralictus coreopsis*(!) Robertson, 1902. Canad. Ent. 34: 249. ♀.  
*Chloralictus coreopsis* Robertson, 1902. Canad. Ent. 34: 250. ♂.  
*Lasioglossum (Chloralictus) robertsonellum* Michener, 1951. In Muesebeck, Krombein, Townes, U. S. Dept. Agr., Agr. Monog. 2: 1117. N. name.  
 Biology: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 388-389, fig. 102 (synonymy, redescription).
- crassiceps** (Ellis). N. Mex.  
*Halictus crassiceps* Ellis, 1914. Ent. News 25: 103. ♀.
- creberrimus** (Smith). N. C. to Fla., La.  
*Halictus creberrimus* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 72. ♀.  
*Halictus ashmeadii* Robertson, 1892. Amer. Nat. 26: 271. ♀.  
*Halictus ashmeadi* Cockerell, 1906. Amer. Ent. Soc., Trans. 32: 294. Emend.
- cressonii** (Robertson). N. S. to N. C., west to Alta., Wash., and Colo. Ecology: Nests in rotten wood above ground. Predator: *Philanthus lepidus* Cress., *P. politus politus* Say.  
*Halictus Cressonii* Robertson, 1890. Amer. Ent. Soc., Trans. 17: 317. ♀, ♂.  
*Halictus (Chloralictus) cressoni* Viereck, 1916. Conn. State Geol. and Nat. Hist. Survey, Bul. 22: 707. Emend.
- cyaneonotus** (Crawford). Nev.  
*Halictus cyaneonotus* Crawford, 1907. Invertebrata Pacifica 1: 193. ♀.
- cyanurus** (Cockerell). Calif.  
*Halictus cyanurus* Cockerell, 1936. Pan-Pacific Ent. 12: 157. ♀.
- daggetti** (Cockerell). Mexico (Baja California), near the border.  
*Halictus daggetti* Cockerell, 1916. Canad. Ent. 48: 57. ♂.
- delectatus** Mitchell. N. B. to N. C., W. Va., Ohio, Ont.  
*Dialictus delectatus* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 435. ♂.

*disbanci* Knerer and Atwood. Ont. and Que.

*Dialictus disbanci* Knerer and Atwood, 1966. Canad. Ent. 98: 882. ♀, ♂.

*disparilis* (Cresson). Kans., Tex., ?N. J., ?Alta., ?Nev.

*Halictus disparilis* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 253. ♀.

*diversopunctatus* (Ellis). Idaho, Wash., Calif., Ariz.

*Halictus diversopunctatus* Ellis, 1914. Ent. News 25: 154. ♀.

*dreisbachi* Mitchell. N. Y., Md., Mich., Minn.

*Dialictus dreisbachi* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 391, fig. 101. ♀, ♂.

*dubitatus* Mitchell. N. Y. (Cortland Co.).

*Dialictus dubitalus* (!) Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 436. ♂. Spelled *dubitatus* in key (p. 376) and in index (p. 533).

*eophilus* (Ellis). N. Mex., Ariz.

*Halictus eophilus* Ellis, 1914. Ent. News 25: 153. ♀.

*evestigatus* (Sandhouse). Colo.

*Halictus evestigatus* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 27. ♂.

*fattigi* Mitchell. N. C., Ga.

*Dialictus fattigi* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 392. ♀.

*flaveriae* Mitchell. Fla.

*Dialictus flaveriae* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 393, figs. 101, 102. ♀, ♂.

*foveolatus* (Robertson). Ill., Mich.

*Chloralictus foveolatus* Robertson, 1902. Canad. Ent. 34: 250. ♂.

*genuinus* (Sandhouse). Ont. to N. C.

*Halictus genuinus* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 36. ♂.

*grinnelli* (Cockerell). Calif.; Mexico (Baja California).

*Halictus grinnelli* Cockerell, 1916. Canad. Ent. 48: 56. ♀.

*halophitus* (Graenicher). N. C. to Fla., La.

*Halictus halophitus* Graenicher, 1927. Psyche 34: 206. ♀, ♂.

*Halictus halophilus* Graenicher, 1930. Ent. Soc. Amer., Ann. 23: 156. Emend.

*hartii* (Robertson). Nebr., Minn. and Ill. to La. and N. C.

*Halictus hartii* Robertson, 1892. Amer. Nat. 26: 268. ♀.

*Halictus rugosus* Crawford, 1902. Canad. Ent. 34: 237. ♀, ♂.

*hemimelas* (Cockerell). Colo., N. Mex.

*Halictus hemimelas* Cockerell, 1901. Psyche, 9: 285. ♀.

*heterognathus* Mitchell. N. B. to Minn., south to N. C. and Tenn.

*Dialictus heterognathus* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 397, figs. 95, 99. ♀.

*Dialictus banksi* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 434, fig. 102. ♂.

Taxonomy: Knerer and Atwood, 1963. Ent. Soc. Wash., Proc. 65: 167. ♂. —Knerer and Atwood, 1966. Canad. Ent. 98: 882 (synonymy).

*highlandicus* Mitchell. N. C., Ont.

*Dialictus highlandicus* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 398. ♀.

*hudsoniellus* (Cockerell). Colo., Ariz.

*Halictus hudsoniellus* Cockerell, 1919. Ent. News 30: 290. ♀.

*hunteri* (Crawford). Tex. to Calif.

*Halictus hunteri* Crawford, 1932. Ent. Soc. Wash., Proc. 34: 72. ♀.

*hyalinus* (Crawford). Wash. to Utah, Ariz., Nev. and Calif.

*Halictus hyalinus* Crawford, 1907. Invertebrata Pacifica 1: 194. ♀.

*illinoensis* (Robertson). Nebr., and Minn. to N. S., south to Tex. and Ga.

*Halictus illinoensis* Robertson, 1892. Amer. Nat. 26: 271. ♀.

*Halictus illinoisensis* Smith, 1910. N. J. State Mus., Ann. Rpt. 1909, p. 688. Emend.

*Halictus (Chloralictus) politissimus* Cockerell, 1917. In W. P. Cockerell, N. Y. Ent. Soc., Jour. 25: 189. ♀.

- imitatus** (Smith). New England and Que. west to Minn., south to Fla. and west to Calif. (Riverside Co.). Parasite: *Paralictus cephalotes* (Dalla Torre), *Pseudomethoca frigida frigida* (Sm.). Predator: *Philanthus albopilosus* Cress., *P. bilunatus* Cress., *P. gibbosus* (Fabr.), *P. lepidus* Cress., *P. politus politus* Say, *P. ventilabris* Fabr.  
*Halictus imitatus* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 71. ♂.  
*Halictus inconspicuus* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 73. ♀.  
*Halictus stultus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 254. ♀.  
*Chloralictus sparsus* Robertson, 1902. Canad. Ent. 34: 249. ♀, ♂.  
*Halictus hortensis* Lovell, 1905. Canad. Ent. 37: 39. ♀.
- Taxonomy:** Cockerell, 1905. Amer. Ent. Soc., Trans. 31: 350 (as *imitatus*). — Cockerell, 1905. Amer. Ent. Soc., Trans. 31: 349 (as *inconspicuus*). — Michener, 1953. Kansas Univ. Sci. Bul. 35: 1027 (larva, as *sparsus*). — Knerer and Atwood, 1962. Ent. Soc. Ontario, Proc. 92: 168.
- Biology:** Michener and Wille, 1961. Kansas Univ. Sci. Bul. 42: 1123-1202, 44 figs., 11 tables (as *inconspicuus*).
- Morphology:** Knerer and Atwood, 1964. Ent. Soc. Wash., Proc. 66: 111-112 (metanotal anomaly).
- impavidus** (Sandhouse). Calif., Nev., Ariz.  
*Halictus impavidus* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 18. ♀.
- impurus** (Cresson). Tex.  
*Halictus impurus* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 252. ♀.
- incompletus** (Crawford). N. Mex., Nev., Calif. Predator: *Philanthus crabroniformis* Sm., *P. gibbosus* (Fabr.), *P. pacificus arizonae* Dunn.  
*Halictus incompletus* Crawford, 1907. Invertebrata Pacifica 1: 195. ♀.
- Taxonomy:** Michener, 1936. Ann. and Mag. Nat. Hist. (10) 19: 284. ♂.
- insolitus** (Sandhouse). Iowa.  
*Halictus insolitus* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 41. ♂.
- insulsus** (Sandhouse). N. Mex.  
*Halictus insulsus* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 29. ♂.
- intrepidus** Mitchell. Ga. (Stone Mt.).  
*Dialictus intrepidus* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 437. ♂.
- jameseae** (Cockerell). Colo.  
*Halictus (Chloralictus) jameseae* Cockerell, 1933. Ent. Soc. Amer., Ann. 26: 41. ♂.
- junaluskensis** Mitchell. N. C., N. Y., Mich., Minn.  
*Dialictus junaluskensis* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 437. ♂.
- kunzei** (Cockerell). Ariz., Calif.  
*Halictus Kunzei* Cockerell, 1898. Canad. Ent. 30: 238. ♀.
- lactineus** (Sandhouse). Colo.  
*Halictus lactineus* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 34. ♂.
- laevissimus** (Smith). N. S. to Alta., south to Ga. and Calif. Predator: *Philanthus crabroniformis* (Sm.), *P. gibbosus* (Fabr.), *P. lepidus* Cress., *P. pacificus arizonae* Dunn., *P. pulcher* Dalla Torre.  
*Halictus laevissimus* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 72. ♀.  
*Halictus levissimus* Dalla Torre, 1896. Cat. Hym., v. 10, p. 68. Emend.  
*Halictus smilacinae* Robertson, 1899. Acad. Sci. St. Louis, Trans. 7: 322. ♀.  
*Halictus euryceps* Ellis, 1914. Ent. News 25: 98. ♀.
- Taxonomy:** Knerer and Atwood, 1962. Canad. Ent. 94: 1228. ♂.
- Biology:** Brittain, 1933. Canada Dept. Agr. Bul. (n. s.) 162: 94 (as *smilacinae*). — Knerer and Atwood, 1962. Ent. Soc. Ontario, Proc. 92: 168.
- latus** (Sandhouse). Colo.  
*Halictus latus* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 20. ♀.
- lazulis** (Ellis). Colo.  
*Halictus lazulis* Ellis, 1913. Ent. News 24: 207. ♀.

**lectus** Mitchell. Ga., D. C., N. J., Ind.

*Dialictus lectus* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 438. ♂.

**leviensis** Mitchell. N. C. to Fla.

*Dialictus leviensis* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 403. ♀.

**lineatulus** (Crawford). Minn. to Newfoundland, south to Tex. and Ga. Predator: *Philanthus*

*albopilosus* Cress., *P. gibbosus* (Fabr.), *P. politus politus* Say, *P. solivagus* Say.

*Halictus lineatulus* Crawford, 1906. Canad. Ent. 38: 5. ♀.

*Halictus subconnexus* Ellis, 1915. Ent. News 26: 291. ♀.

Biology: Knerer and Atwood, 1962. Ent. Soc. Ontario, Proc. 92: 169.

Morphology: Knerer and Atwood, 1964. Ent. Soc. Wash., Proc. 66: 111-112 (metanotal anomaly).

**lionotus** Sandhouse. Colo.

*Dialictus lionotus* Sandhouse, 1923. Canad. Ent. 55: 194. ♂.

**longicornis** (Crawford). Calif.

*Halictus longicornis* Crawford, 1907. Invertebrata Pacifica 1: 195. ♂.

**mactus** (Sandhouse). Colo.

*Halictus mactus* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 37. ♂.

**malinus** (Sandhouse). Va.

*Halictus malinus* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 40. ♂.

**marinensis** (Michener). Calif.

*Halictus (Chloralictus) marinensis* Michener, 1936. Pan-Pacific Ent. 12: 167. ♀.

**marinus** (Crawford). Mass. to Fla.

*Halictus marinus* Crawford, 1904. Ent. News 15: 99. ♀.

Taxonomy: Graenicher, 1927. Psyche 34: 204. ♂. —Graenicher, 1930. Ent. Soc. Amer., Ann. 23: 156.

**megastictus** (Cockerell). Calif. (San Miguel Island).

*Halictus (Chloralictus) megastictus* Cockerell, 1937. Pan-Pacific Ent. 13: 152. ♀, ♂.

**meritus** (Sandhouse). Colo.

*Halictus meritus* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 19. ♀.

**merosus** (Sandhouse). N. Mex.

*Halictus merosus* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 40. ♂.

**mesillensis** (Cockerell). Tex. to Nev. and Calif.; Mexico (Hidalgo).

*Halictus nymphalis* race *mesillensis* Cockerell, 1898. Denison Univ. Sci. Labs., Bul. 11: 47.

♀. Republished by Cockerell, 1898. N. Mex. Univ., Bul. 1: 47. female.

**microlepoides** (Ellis). N. Mex., Ariz., Calif.; north. Mexico. Predator: *Philanthus gibbosus*

(Fabr.), *P. multimaculatus* Cam., *P. ventilabris* Fabr.

*Halictus microlepoides* Ellis, 1914. Ent. News 25: 152. ♀.

Biology: Alcock and Gamboa, 1975. Ariz. Acad. Sci. 10: 163 (predator).

**miniatus** Mitchell. Fla.

*Dialictus miniatus* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 405. ♀.

**mollis** (Sandhouse). Colo.

*Halictus mollis* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 39. ♂.

**nevadensis** (Crawford). Ariz., Nev., Calif.; Mexico (Baja California).

*Halictus nevadensis* Crawford, 1907. Invertebrata Pacifica 1: 195. ♀.

*Halictus (Chloralictus) pasadenae* Michener, 1936. Ann. and Mag. Nat. Hist. (10) 18: 285. ♀, ♂.

Taxonomy: Timberlake In Michener, 1951. In Muesebeck, Krombein and Townes, U. S. Dept. Agr., Agr. Monog. 2: 1115 (synonymy).

**nigroviridis** (Graenicher). B. C. to N. B., south to Ga.

*Halictus nigro-viridis* Graenicher, 1910. Pub. Mus. City Milwaukee, Bul. 1: 233. ♀.

**novascotiae** Mitchell. N. S. to New England.

*Dialictus novascotiae* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 407. ♀.

Taxonomy: Knerer and Atwood, 1964. Ent. News 75: 5, fig. 1. ♂.

**nymphaearum** (Robertson). Minn. and Kans. to N. S., south to Ga.

- Halictus palustris* Robertson, 1890. Amer. Ent. Soc., Trans. 17: 317. ♀, ♂. Preocc.  
*Halictus nymphaearum* Robertson, 1895. Amer. Ent. Soc., Trans. 22: 117. N. name.  
*Halictus paludicola* Dalla Torre, 1896. Cat. Hym., v. 10, p. 75. N. name.  
*Halictus oceanicus* Cockerell, 1916. Brooklyn Ent. Soc., Bul. 11: 11. ♀.

**nymphalis** (Smith). Minn. and Mass. south to Tex. and Fla.

- Halictus nymphalis* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 68. ♀.

Taxonomy: Cockerell, 1905. Amer. Ent. Soc., Trans. 31: 352.

**oblongus** (Lovell). Colo., Minn. and N. S., south to N. Mex., La. and Ga. Ecology: Nests in rotten wood above ground.

- Halictus oblongus* Lovell, 1905. Canad. Ent. 37: 40. ♀.  
*Halictus planatus* Lovell, 1905. Canad. Ent. 37: 300. ♀.

Taxonomy: Lovell, 1908. Psyche 15: 39. ♂.

**obnubilus** (Sandhouse). Colo.

- Halictus (Chloralictus) obnubilus* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 28. ♂.

**obscurus** (Robertson). Minn. and Ill. to Conn. and Ont., south to Ga. Predator: *Philanthus gibbosus* (Fabr.).

- Halictus obscurus* Robertson, 1892. Amer. Nat. 26: 270. ♀.

**occidentalis** Crawford. Colo., N. Mex.

- Dialictus occidentalis* Crawford, 1902. Canad. Ent. 34: 318. ♀.  
*Halictus galei* Cockerell, 1919. Canad. Ent. 51: 272. ♀.

**oleosus** (Cockerell). Colo., N. Mex.

- Halictus oleosus* Cockerell, 1898. Denison Univ. Sci. Labs., Bul. 11: 47. ♀. Republished by Cockerell, 1898. N. Mex. Univ., Bul. 1: 47, female.

**orbitatus** Mitchell. Minn. to Conn. and Ont., south to N. C. and W. Va.

- Dialictus orbitatus* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 440, fig. 101. ♂.

**ornduffi** Hurd. Calif. Pollen: Apparently a narrowly polylectic visitor to the flowers of *Jepsonia heterandra*, but also visits flowers of *Compositae* apparently for nectar.

- Dialictus ornduffi* Hurd, 1970. Pan-Pacific Ent. 46: 210. ♀, ♂.

Biology: Ornduff, 1971. Evolution 25: 300-311, 1 fig., 7 tables (role in pollination of *Jepsonia heterandra*).

**otsegoensis** Mitchell. Mich. (Otsego Co.).

- Dialictus otsegoensis* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 440. ♂.

**pacatus** (Sandhouse). Colo.

- Halictus pacatus* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 16. ♀.

**pallidellus** (Ellis). N. Mex., Utah, Calif.

- Halictus pallidellus* Ellis, 1914. Ent. News 25: 151. ♀.

**paradmirandus** Knerer and Atwood. Ont.

- Dialictus paradmirandus* Knerer and Atwood, 1966. Canad. Ent. 98: 886. ♀, ♂.

**paululus** (Sandhouse). Colo.

- Halictus paululus* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 23. ♂.

**pavoninus** (Ellis). Colo.

- Halictus pavoninus* Ellis, 1913. Ent. News 24: 206. ♀.

**pensitus** (Sandhouse). Colo.

- Halictus pensitus* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 38. ♂.

**perdifficilis** (Cockerell). Colo., N. Mex.; north. Mexico.

- Halictus perdifficilis* Cockerell, 1895. Ann. and Mag. Nat. Hist. (6) 16: 68. ♀.  
*Halictus perficilis* (!) Cockerell, 1897. N. Mex. Agr. Expt. Sta., Bul. 24: 19.

Taxonomy: Cockerell, 1901. Ann. and Mag. Nat. Hist. (7) 7: 126.

**perexiguus** (Sandhouse). N. Mex.

- Halictus perexiguus* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 26. ♂.

**perichlarus** (Cockerell). Calif.

- Halictus (Chloralictus) perichlarus* Cockerell, 1937. Pan-Pacific Ent. 13: 153. ♀, ♂.  
*Halictus perichlorus* Cockerell, 1939. Calif. Acad. Sci., Proc. (4) 23: 428. Emend.

- perparvus** (Ellis). Ariz., Calif.; Mexico. Predator: *Philanthus multimaculatus* Cam.  
*Halictus perparvus* Ellis, 1914. Ent. News 25: 102. ♀.
- perpunctatulus** Knerer and Atwood. Boreal Canada.  
*Dialictus perpunctatulus* Knerer and Atwood, 1966. Canad. Ent. 98: 884. ♀, ♂.
- perpunctatus** (Ellis). N. B. to Ga., west to N. Mex., Colo. and Calif.  
*Halictus perpunctatus* Ellis, 1913. Ent. News 24: 210. ♀.  
*Halictus brycinei* Crawford, 1932. Ent. Soc. Wash., Proc. 34: 70. ♀.
- perspicuus** Knerer and Atwood. Ont., south to N. Y., west to Minn.  
*Dialictus perspicuus* Knerer and Atwood, 1966. Canad. Ent. 98: 883. ♀, ♂.
- petrellus** (Cockerell). Calif.; Mexico (Baja California).  
*Halictus petrellus* Cockerell, 1903. South. Calif. Acad. Sci., Bul. 2: 84. ♀.  
*Halictus coronadensis* Cockerell, 1916. Canad. Ent. 48: 56. ♂.
- phaceliarum** (Cockerell). Colo.  
*Halictus phaceliarum* Cockerell, 1919. N. Y. Ent. Soc., Jour. 27: 299. ♀.
- philanthus** Mitchell. N. C., N. Y., Mich., Ont. Predator: *Philanthus* sp.  
*Dialictus philanthus* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 441. ♂.
- pictus** (Crawford). Nebr., Minn., Wis., Mich., Ill., Ont.  
*Halictus pictus* Crawford, 1902. Canad. Ent. 34: 236. ♀.  
*Halictus graenicheri* Ellis, 1914. N. Y. Ent. Soc., Jour. 22: 221. ♀.  
*Dialictus muskegonensis* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 439. ♂.
- Biology: Knerer and Atwood, 1962. Ent. Soc. Ontario, Proc. 92: 170.
- piki** (Sandhouse). Colo.  
*Halictus piki* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 28. ♂.
- pilosellus** (Cockerell). Calif.  
*Halictus pilosellus* Cockerell, 1936. Pan-Pacific Ent. 12: 160. ♀.
- pilosicaudus** (Cockerell). Calif. (San Miguel Isl.).  
*Halictus* (*Chloralictus*) *pilosicaudus* Cockerell, 1937. Pan-Pacific Ent. 13: 155. ♀.
- pilosus floridanus** (Robertson). N. C. to Fla.  
*Halictus floridanus* Robertson, 1892. Amer. Nat. 26: 269. ♀.
- pilosus pilosus** (Smith). Colo. and Minn. to N. S., south. to Ga. Parasite: *Sphecodes atlantis* Mitchell. Predator: *Philanthus albopilosus*, *P. gibbosus* (Fabr.), *P. politus politus* Say.  
*Halictus pilosus* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 71. ♀.  
*Halictus pilosus* var. *leucomus* Lovell, 1908. Psyche 15: 37. ♀.  
*Halictus floridanus caesareus* Cockerell, 1916. Brooklyn Ent. Soc., Bul. 11: 11. ♀.
- Taxonomy: Robertson, 1895. Amer. Ent. Soc., Trans. 22: 117. ♂. —Cockerell, 1905. Amer. Ent. Soc., Trans. 31: 351. —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 152: 547.
- Biology: Knerer and Atwood, 1962. Ent. Soc. Ontario, Proc. 92: 170.
- placidensis** Mitchell. Fla.  
*Dialictus placidensis* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 441. ♂.
- praepes** (Sandhouse). Colo.  
*Halictus praepes* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 30. ♂.
- pruiniformis** (Crawford). Alta., S. D., Iowa, Nebr., N. Mex., Tex., Ariz., Nev., Calif. Predator: *Philanthus multimaculatus* Cam.  
*Halictus pruiniformis* Crawford, 1906. Canad. Ent. 38: 284. ♀, ♂.  
*Halictus glaucovirens* Cockerell, 1919. Ent. News 30: 290. ♀.  
*Halictus exalbidus* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 24. ♂.
- pruinus** (Robertson). New England states, south to N. J., west to Alta. and Ariz. Parasite: *Rhipiphorus fasciatus* Say. Predator: *Philanthus ventilabris* Fabr.  
*Halictus pruinus* Robertson, 1892. Amer. Nat. 26: 269. ♀, ♂.
- Biology: Melander and Brues, 1903. Biol. Bul. 5: 1.
- pseudotegularis** (Cockerell). N. Mex.; Mexico  
*Halictus pseudotegularis* Cockerell, 1896. Ann. and Mag. Nat. Hist. (6) 18: 294. ♀.
- pudicus** (Sandhouse). Colo.  
*Halictus pudicus* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 33. ♂.

- punctatoventris** (Crawford). Calif.; Mexico (Baja California).  
*Halictus punctatoventris* Crawford, 1907. *Invertebrata Pacifica* 1: 196. ♀, ♂.
- punctiferellus** (Cockerell). Calif. (San Miguel Island).  
*Halictus (Chloralictus) punctiferellus* Cockerell, 1937. *Pan-Pacific Ent.* 13: 154. ♀.
- raleighensis** (Crawford). N. C. to Fla.  
*Halictus raleighensis* Crawford, 1932. *Ent. Soc. Wash., Proc.* 34: 73. ♀.
- reticulatus** (Robertson). Ill. and Mich. to Maine, south to Fla.  
*Halictus fulvipes* Smith, 1853. *Cat. Hym. Brit. Mus.*, v. 1, p. 67. ♀. Preocc.  
*Halictus reticulatus* Robertson, 1892. *Amer. Nat.* 26: 268. ♀.  
*Halictus rhododactylus* Dalla Torre, 1896. *Cat. Hym.*, v. 10, p. 80. ♀. N. name.
- Taxonomy: Cockerell, 1905. *Amer. Ent. Soc., Trans.* 31: 351. — Mitchell, 1958. *In* Krombein, U. S. Dept. Agr., Agr. Monog. 2, sup. 1: 230. (synonymy).
- rhodognathus** (Cockerell). Tex.  
*Halictus (Chloralictus) rhodognathus* Cockerell, 1917. *In* W. P. Cockerell, N. Y. Ent. Soc., Jour. 25: 190. ♀.
- richardsoni** (Cockerell). Alta.  
*Halictus (Chloralictus) richardsoni* Cockerell, 1937. *Canad. Ent.* 69: 113. ♀.
- rohweri** (Ellis). Minn. to Maine and Ont., south to Ga. Parasite: *Pseudomethoca frigida frigida* (Sm.). Predator: *Philanthus gibbosus* (F.).  
*Halictus subconnexus rohweri* Ellis, 1915. *Ent. News* 26: 292. ♀.
- Taxonomy: Knerer and Atwood, 1962. *Canad. Ent.* 94: 1230. ♂.
- Biology: Knerer and Atwood, 1962. *Ent. Soc. Ontario, Proc.* 92: 171. — Breed, 1975. *Kansas Ent. Soc., Jour.* 48: 64-80, 3 figs., 7 tables (life cycle, behavior).
- rufulipes** (Cockerell). Sask.  
*Halictus (Chloralictus) rufulipes* Cockerell, 1938. *Amer. Mus. Novitates* 983: 3. ♀.
- ruidosensis** (Cockerell). Colo., N. Mex., Ariz. Predator: *Philanthus pacificus arizonae* Dunn., *P. pulcher* Dalla Torre.  
*Halictus ruidosensis* Cockerell, 1897. *Ann. and Mag. Nat. Hist.* (6) 20: 142. ♀, ♂.
- sagax** (Sandhouse). Colo.  
*Halictus sagax* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 25. ♂.
- sandhouseae** (Michener). Colo., Minn., Ont.  
*Halictus occultus* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 27. ♂. Preocc. by Vachal, 1904.  
*Lasioglossum (Chloralictus) sandhouseae* Michener, 1951. *In* Muesebeck, Krombein, Townes, U. S. Dept. Agr., Agr. Monog. 2: 1117. N. name.
- Taxonomy: Knerer and Atwood, 1964. *Ent. News* 75: 7. (female).
- scrophulariae** (Cockerell). Colo.  
*Halictus (Chloralictus) scrophulariae* Cockerell, 1906. *Amer. Mus. Nat. Hist., Bul.* 22: 428. ♀.
- sedi** (Sandhouse). Calif., Oreg., Colo.  
*Halictus sedi* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 12. ♀.
- Taxonomy: Timberlake *In* Michener, 1958. *In* Krombein, U. S. Dept. Agr., Agr. Monog. 2, Sup. 1: 230 (tax. status).
- semibrunneus** (Cockerell). N. Mex.  
*Halictus semibrunneus* Cockerell, 1895. *Ann. and Mag. Nat. Hist.* (6) 16: 67. ♀.
- semicaeruleus** (Cockerell). N. Mex.  
*Halictus semicaeruleus* Cockerell, 1895. *Ann. and Mag. Nat. Hist.* (6) 16: 66. ♀.
- solidaginis** Mitchell. Mich. to Maine, south to Ind., W. Va., and N. Y.  
*Dialictus solidaginis* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 443, fig. 102. ♂.
- stictaspis** Sandhouse. N. Mex.  
*Dialictus stictaspis* Sandhouse, 1923. *Canad. Ent.* 55: 195. ♂.
- stuartensis** Mitchell. Fla. (Stuart).  
*Dialictus stuartensis* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 419. ♀.

- subversans** Mitchell. Mich., N. Y.  
*Dialictus subversans* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 419. ♀.
- subviridatus** (Cockerell). Sask.  
*Halictus (Chloralictus) subviridatus* Cockerell, 1938. Amer. Mus. Novitates 983: 2. ♀, ♂.
- succinipennis** (Ellis). Colo.  
*Halictus succinipennis* Ellis, 1913. Ent. News 24: 205. ♀.
- supraclypeatus** Mitchell. Va., Mich., Tenn., Mo.  
*Dialictus supraclypeatus* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 420, fig. 99. ♀.
- surianae** Mitchell. Fla.  
*Dialictus surianae* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 420. ♀.
- tahitensis** Mitchell. Fla. (Tahiti Beach).  
*Dialictus tahitensis* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 421. ♀.
- tamiamensis** Mitchell. Fla.  
*Dialictus tamiamensis* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 421, figs. 98, 101, 102. ♀, ♂.
- tarponensis** Mitchell. Fla., Ga.  
*Dialictus tarponensis* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 423. ♀.
- tegulariformis** (Crawford). Idaho, Utah, Nev., N. Mex., Ariz., Calif.; Mexico (Baja California).  
 Predator: *Philanthus pacificus arizonae* Dunn.  
*Halictus tegulariformis* Crawford, 1907. Invertebrata Pacifica 1: 194. ♀, ♂.  
*Halictus helianthi* Cockerell, 1916. Canad. Ent. 48: 77. ♀.  
*Halictus gaudialis* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 23. ♂.  
 Taxonomy: Michener, 1936. Ann. and Mag. Nat. Hist. (10) 18: 283. ♂.
- Biology: Timberlake In Michener, 1951. In Muesebeck, Krombein, Townes, U. S. Dept. Agr., Agr. Monog. 2: 1118 (synonymy).
- tegularis** (Robertson). Minn. to N. H., south to Tex. and Fla.; recorded probably erroneously from Mont., Colo., Calif., and Mexico. Predator: *Philanthus lepidus* Cress.  
*Halictus tegularis* Robertson, 1890. Amer. Ent. Soc., Trans. 17: 318. ♀, ♂.  
*Halictus ellisiae* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 11. ♀.  
*Halictus lepidii* Graenicher, 1927. Psyche 34: 204. ♀, ♂.
- tenax** (Sandhouse). Colo.  
*Halictus tenax* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 15. ♀.
- tenuis** (Ellis). Colo.  
*Halictus tenuis* Ellis, 1913. Ent. News 24: 208. ♀.
- testaceus** (Robertson). N. C., Wis., Ill., N. Dak.  
*Halictus testaceus* Robertson, 1897. Acad. Sci. St. Louis, Trans. 7: 323. ♀.
- theodori** Crawford. N. Mex.  
*Dialictus Theodori* Crawford, 1902. Canad. Ent. 34: 318. ♀.
- tranquillus** (Sandhouse). N. Mex.  
*Halictus tranquillus* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 32. ♂.
- unicus** (Sandhouse). Minn., Mich., N. H., Ont., Va., N. C.  
*Halictus unicus* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 21. ♀.
- vanduzeei** (Sandhouse and Cockerell). South. Calif. (Inyo County); Mexico (Baja California).  
*Halictus vanduzeei* Sandhouse and Cockerell, 1924. Calif. Acad. Sci., Proc. (4) 13: 334. ♀.
- veganus** (Cockerell). N. Mex., Calif.  
*Halictus veganus* Cockerell, 1901. Psyche 9: 286. ♀.
- versans** (Lovell). Minn. to Newfoundland, south to Ga.; reportedly introduced in vicinity of San Francisco. Predator: *Philanthus lepidus* Cress, *P. solivagus* Say.  
*Halictus versans* Lovell, 1905. Canad. Ent. 37: 39. ♀ (♂ misdet.).  
*Halictus consonus* Sandhouse, 1924. U. S. Natl. Mus., Proc. 65 (19): 30. ♂.
- versatus** (Robertson). Minn. to Ont., south to Ga. and La. Parasite: *Pseudomethocha frigida frigida* (Sm.)? Predator: *Philanthus ventilabris* Fabr.  
*Chloralictus versatus* Robertson, 1902. Canad. Ent. 34: 249. ♀, ♂.



- Biology: Michener, 1966. Kansas Ent. Soc., Jour. 39: 193-217 (bionomics).  
**vierecki** (Crawford). Minn. to New England, south to La. and Ga.  
*Halictus vierecki* Crawford, 1904. Ent. News 15: 97. ♀.  
 Taxonomy: Graenicher, 1910. Canad. Ent. 42: 158. ♂.  
**viridatulus** (Cockerell). Colo., Calif.  
*Halictus viridatulus* Cockerell, 1919. Ent. News 30: 290. ♀.  
**viridatus** (Lovell). Minn. to N. S., south to La. and Ga.  
*Halictus viridatus* Lovell, 1905. Canad. Ent. 37: 300. ♀.  
*Dialictus lepidus* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 438. ♂.  
 Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 547.  
 Biology: Atwood, 1933. Canad. Jour. Res. 9: 453.  
**weemsi** Mitchell. N. C., Ga.  
*Dialictus weemsi* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 431, fig. 99. ♀.  
**wheeleri** Mitchell. Mass. (Forest Hills).  
*Dialictus wheeleri* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 445. ♂.  
**zephyrus** (Smith). Maine to Ga., west to Minn., Colo. and Tex., Utah, Oreg. Parasite: *Paralictus cephalotes* (Dalla Torre), *Pseudomethoca frigida* (Sm.). Predator: *Philanthus gibbosus* (F.).  
*Halictus zephyrus* Smith, 1853. Cat. Hym. Brit. Mus., v. 2, p. 68. ♂.  
 Taxonomy: Robertson, 1895. Amer. Ent. Soc., Trans. 22: 117. ♀. — Cockerell, 1905. Amer. Ent. Soc., Trans. 31: 352. ♂.  
 Biology: Rau, 1922. Acad. Sci. St. Louis, Trans. 24 (7): 1. — Rau, 1926. Acad. Sci. St. Louis, Trans. 25: 157. — LaBerge and Isakson, 1963. Ent. News 74: 113-116. — Lin, 1964. Ins. Sociaux 11: 187-192 (reaction to mutillid parasitism). — Batra, 1964. Ins. Sociaux 11: 159-186, 20 figs. (behavior). — Batra, 1965. Kansas Ent. Soc., Jour. 38: 367-389 (associated organisms). — Batra, 1966. Kansas Univ. Sci. Bul. 46: 359-423 (life cycle, behavior). — Michener and Brothers, 1971. Kansas Ent. Soc., Jour. 44: 236-239. — Michener, Brothers and Kamm, 1971. Kansas Ent. Soc., Jour. 44: 276-279 (queen-worker relationships). — Michener, Brothers and Kamm, 1971. Natl. Acad. Sci. U. S. A., Proc. 68: 1241-1245 (interactions within colonies). — Bell, 1973. Ins. Sociaux 20: 189-196. — Bell, 1973. Ins. Sociaux 20: 253-260 (factors controlling initiation of vitellogenesis). — Barrows and Snyder, 1973. Ent. News 84: 314-316. — Kamm, 1974. Kansas Ent. Soc., Jour. 47: 8-18 (effects of temperature, day length and number of adults on size of cells and offspring). — Brothers and Michener, 1974. Jour. Compar. Physiol. 90: 129-168 (ethometry of division of labor). — Brothers, 1974. Acad. Natl. Sci. U. S. A., Proc. 71: 671-674 (origin of altruism). — Bell, Breed, Richards and Michener, 1974. Jour. Compar. Physiol. 93: 173-181 (nest defense). — Bell and Hawkins, 1974. Jour. Compar. Physiol. 13: 183-193 (nest defense). — Bell, 1974. Jour. Compar. Physiol. 13: 195-202 (intraspecific defense of nests). — Barrows, 1975. Behavioral Biol. 15: 57-64 (female odor production, male response). — Kumar, 1975. Kansas Ent. Soc., Jour. 48: 374-380, 3 tables (cell size). — Barrows, Bell, and Michener, 1975. Natl. Acad. Sci. U. S. A., Proc. 72: 2824-2828 (individual odor differences and their social functions). — Breed and Gamboa, 1977. Science 195: 694-696, 2 figs. (behavioral control of workers by queens).  
**zophops** (Ellis). Colo.  
*Halictus zophops* Ellis, 1914. Ent. News 25: 97. ♀.

### Genus PARALICTUS Robertson

*Paralictus* Robertson, 1901. Canad. Ent. 33: 299.

Type-species: *Halictus cephalotes* Dalla Torre. Orig. desig. (= *Halictus cephalicus* Robertson).

Members of this genus are believed to beinquilines in the nests of the genus *Dialictus*.

Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 445-450, figs. 103, 104, table 13 (included species).

*asteris* Mitchell. N. Y. to N. C., west to Mich., Ind. and Tenn. Ecology: Visits flowers of *Aster* and *Robinia*.

*Paralictus asteris* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 446. ♀, ♂.

*cephalotes* (Dalla Torre). Minn. to Conn., south to N. C. Ecology: Visits flowers of *Gonolobus laevis*, *Leucanthemum*, *Salix nigra*. Host: *Dialictus imitatus* (Sm.).

*Halictus cephalicus* Robertson, 1892. Amer. Nat. 26: 270. ♀, ♂. Preocc.

*Halictus cephalotes* Dalla Torre, 1896. Cat. Hym., v. 10, p. 57. N. name.

*michiganensis* Mitchell. Mich. (Wayne Co.).

*Paralictus michiganensis* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 148. ♀.

*platyparius* (Robertson). Minn., Mich., and Md., south to N. C. Ecology: Visits flowers of *Aster*, *Cucurbita*, *Erigeron*, *Gnaphalium*, *Gonolobus*, *Koellia*, *Rhus*, *Salix*, *Solidago*, *Taraxacum*, *Zanthoxylum*, *Zizia*.

*Halictus platyparius* Robertson, 1895. Amer. Ent. Soc., Trans. 22: 117. ♀.

*simplex* Robertson. Mich. to Mass., south to N. C. Ecology: Visits flowers of *Achillea*, *Ranunculus*, *Rubus*, *Solidago*, *Zizia*.

*Paralictus simplex* Robertson, 1901. Canad. Ent. 33: 230. ♀.

### Genus SPHECODES Latreille

*Sphecodes* Latreille, 1804. Nouv. Dict. Hist. Nat., v. 24, p. 182.

Type-species: *Sphex gibba* Linnaeus. Monotypic.

*Dichroa* Illiger, [1806]. Mag. Insektenk. 5: 39.

Type-species: *Sphex gibba* Linnaeus. Desig. by Sandhouse, 1943.

*Sabulicola* Verhoeff, 1890. Ent. Nachr. 16: 328.

Type-species: *Sabulicola cirsii* Verhoeff. Monotypic.

*Drepanium* Robertson, 1903. Ent. News 14: 103.

Type-species: *Sphecodes falcifer* Patton. Monotypic.

*Proteraner* Robertson, 1903. Ent. News 14: 103.

Type-species: *Sphecodes ranunculi* Robertson. Monotypic.

*Sphecodium* Robertson, 1903. Ent. News 14: 104.

Type-species: *Sphecodes mandibularis* Cresson. Orig. desig. (= *Sphecodium cressonii* Robertson).

*Machaeris* Robertson, 1903. Ent. News 14: 104.

Type-species: *Sphecodes stygius* Robertson. Orig. desig.

*Dialonia* Robertson, 1903. Ent. News 14: 104.

Type-species: *Sphecodes antennariae* Robertson. Monotypic and orig. desig.

*Sphecodes* subg. *Microsphecodes* Eickwort and Stage, 1972. Kans. Ent. Soc., Jour. 45: 501.

Type-species: *Sphecodes kathleenae* Eickwort. Orig. desig.

This is a large and nearly worldwide genus of parasitic bees. While most of the species are cleptoparasites in the nests of other Halictinae, some are parasitic in the nests of certain species of Andrenidae and Colletidae. The adults visit a wide variety of flowers often in the company of their pollen collecting hosts.

There are obviously several subgenera of the genus *Sphecodes* represented in the Nearctic Region and some of the names cited above are available. However, until further studies are made, it is not possible to establish the limits of the subgenera present in our area.

Taxonomy: Robertson, 1903. Ent. News 14: 103 (Illinois species). —Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 20: 450-451 (key to large species). —Lovell and Cockerell, 1907. Psyche 14: 101 (Maine species). —Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 469-506 (eastern U. S. spp.). —Torchio, 1975. Kans. Ent. Soc., Jour. 48: 264-265, 269-275, 278-279, figs. 15-18, 27 (life history, larvae, pupae).

*antennariae* Robertson. Wis. and Mich. to N. C.

*Sphecodes antennariae* Robertson, 1891. Amer. Ent. Soc., Trans. 18: 63. ♀.

*aroniae* Mitchell. Va., N. C.

*Sphecodes aroniae* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 474. ♀, ♂.

*arroyanus* Cockerell. Alta., N. D., Colo., N. Mex., Calif.

*Sphecodes arroyanus* Cockerell, 1904. Entomologist 37: 231. ♀.

- arvensiformis** Cockerell. Colo., Utah, Oreg., Calif. Host: *Halictus farinosus* Sm.  
*Sphecodes arvensiformis* Cockerell, 1904. In Viereck, Canad. Ent. 36: 232. ♀.  
*Sphecodes levequeae* Cockerell, 1929. Ann. and Mag. Nat. Hist. (10) 4: 296. ♀.
- Taxonomy: Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 191. ♂.
- asclepiadis** Cockerell. N. Mex.  
*Sphecodes asclepiadis* Cockerell, 1898. Denison Univ. Sci. Labs., Bul. 11: 45. ♀.  
 Republished by Cockerell, 1898. N. Mex. Univ., Bul. 1: 45. female.
- atlantis** Mitchell. Vt. and Mass., south to Fla., west to Tex., Ark., Tenn., Mich., Minn. Host:  
*Dialictus pilosus pilosus* (Sm.).  
*Sphecodes atlantis* Mitchell, 1956. Elisha Mitchell Sci. Soc., Jour. 72: 221. ♀, ♂.
- autumnalis** Mitchell. Mich., Ont. and N. Y., south to N. C.  
*Sphecodes autumnalis* Mitchell, 1956. Elisha Mitchell Sci. Soc., Jour. 72: 209. ♀, ♂.
- banksii** Lovell. Minn. to N. Y., south to Fla.  
*Sphecodes banksii* Lovell, 1909. Ent. News 20: 416. ♀.
- borealis** Cockerell. Sask.  
*Sphecodes borealis* Cockerell, 1937. Amer. Mus. Novitates 909: 2. ♂.
- brachycephalus** Mitchell. N. C. to Fla. Host: *Calliopsis andreniformis* Sm?  
*Sphecodes brachycephalus* Mitchell, 1956. Elisha Mitchell Sci. Soc., Jour. 72: 207. ♀, ♂.
- californicus** Meyer. Calif.; Mexico.  
*Sphecodes californicus* Meyer, 1922. Arch. Naturgesch. 88 (Abt. A, Heft. 8): 173. ♀.
- carolinus** Mitchell. Minn. to Maine, south to Tenn. and N. C.  
*Sphecodes carolinus* Mitchell, 1956. Elisha Mitchell Sci. Soc., Jour. 72: 219. ♀.
- castaneae** Mitchell. Va. (Falls Church).  
*Sphecodes castaneae* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 480. ♀.
- clematidis** Robertson. Man. and Kans. to N. S., south to N. C.  
*Sphecodes clematidis* Robertson, 1897. Acad. Sci. St. Louis, Trans. 7: 320. ♀, ♂.  
*Sphecodes obscurans* Lovell and Cockerell, 1907. Psyche 14: 103. ♀.  
*Sphecodes australis* Mitchell, 1956. Elisha Mitchell Sci. Soc., Jour. 72: 213. ♂.
- columbiae** Cockerell. Wash.  
*Sphecodes columbiae* Cockerell, 1906. Canad. Ent. 38: 280. ♀.
- confertus** Say. Minn. and Colo. to N. S., Tex. and Ga.  
*Sphecodes confertus* Say, 1837. Boston Jour. Nat. Hist. 1: 392.  
*Sphecodes falcifer* Patton, 1880. Amer. Ent. 1: 230. ♀, ♂.  
*Drepanum falciferum* Robertson, 1903. Ent. News 14: 105. ♀, ♂.  
*Sphecodes pithanus* Lovell, 1909. Ent. News 20: 122. ♀.
- Taxonomy: Robertson, 1897. Acad. Sci. St. Louis, Trans. 7: 317. ♂, ♀.
- coronus** Mitchell. Minn. to Que. and New England, south to N. C.  
*Sphecodes coronus* Mitchell, 1956. Elisha Mitchell Sci. Soc., Jour. 72: 215. ♂.  
*Sphecodes canadensis* Mitchell. 1956. Elisha Mitchell Sci. Soc., Jour. 72: 218. ♂.
- crawfordi** Mitchell. N. C. (Bryson City).  
*Sphecodes crawfordi* Mitchell, 1956. Elisha Mitchell Sci. Soc., Jour. 72: 217. ♀.
- cressonii** (Robertson). Minn. and Ont. to New England, south to Mo. and N. C.  
*Sphecodium cressonii* Robertson, 1903. Ent. News 14: 106. ♀, ♂.  
*Sphecodes nephelotus* Lovell and Cockerell, 1907. Psyche 14: 106. ♂.  
*Sphecodes nubilus* Lovell, 1909. Ent. News 20: 124, 417. Error for *nephelotus*.  
*Sphecodes heterurus* Lovell, 1911. Ent. News 22: 212. ♀.
- davisii** Robertson. Minn. and Ont. to N. Y. and New England. Predator: *Philanthus solivagus* Say.  
*Sphecodes davisii* Robertson, 1897. Acad. Sci. St. Louis, Trans. 7: 319. ♂.
- Taxonomy: Graenicher, 1910. Canad. Ent. 42: 159. ♂, ♀.
- dichrous** Smith. Minn. to N. S., south to Mo. and Ga. Host: *Halictus rubicundus* (Chr.).  
 Predator: *Philanthus gibbosus* (Fabr.).  
*Sphecodes dichroa* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 38. ♀ (not male).  
*Sphecodes arvensis* Patton, 1880. Amer. Ent. 1: 230. ♀, ♂.

- ?Halictus scabrosus* Provancher, 1882. Nat. Canad. 13: 200. ♂.  
*Sphecodes lautus* Lovell and Cockerell, 1907. Psyche 14: 103. ♀.  
*Sphecodes (Sphecodes) macfarlandi* Viereck, 1909. Ent. News 20: 292. ♀.  
**eustictus** Cockerell. Wash., Colo.  
*Sphecodes eustictus* Cockerell, 1906. Canad. Ent. 38: 162. ♀.  
**exaltus** Mitchell. N. C. (Southern Pines).  
*Sphecodes exaltus* Mitchell, 1956. Elisha Mitchell Sci. Soc., Jour. 72: 217. ♀.  
**fattigi** Mitchell. Fla. (Gainesville).  
*Sphecodes fattigi* Mitchell, 1956. Elisha Mitchell Sci. Soc., Jour. 72: 220. ♂.  
**fortior** Cockerell. N. Mex., Ariz., Calif.  
*Sphecodes fortior* Cockerell, 1898. Denison Univ. Sci. Labs., Bul. 11: 44. ♀. Republished by Cockerell, 1898. N. Mex. Univ., Bul. 1: 44. female.  
 Biology: Newberry, 1899. Psyche 9: 94.  
**fragariae** Cockerell. Colo., N. Mex. Host: *Perdita nuda* Kkll?  
*Sphecodes fragariae* Cockerell, 1903. In Viereck, Amer. Ent. Soc., Trans. 29: 99.  
**galerus** Lovell and Cockerell. N. H. and Vt. to Va.  
*Sphecodes galerus* Lovell and Cockerell, 1907. Psyche 14: 106. ♀.  
**heraclei** heraclei Robertson. Ill. to New England south to Ala. and Fla.  
*Sphecodes heraclei* Robertson, 1897. Acad. Sci. St. Louis, Trans. 7: 318. ♀.  
**heraclei ignitus** Cockerell. Ala., Fla.  
*Sphecodes ignitus* Cockerell, 1922. U. S. Natl. Mus., Proc. 60 (18): 13. ♂.  
**hesperellus** Cockerell. Wash., Oreg., Calif.  
*Sphecodes (Sphecodes) hesperellus* Cockerell, 1904. In Viereck, Canad. Ent. 36: 232. ♀.  
**hudsoni** Cockerell. Hudson's Bay, Canada.  
*Sphecodes hudsoni* Cockerell, 1913. Canad. Ent. 45: 12. ♀.  
**hydrangeae** Mitchell. Conn. to N. C.  
*Sphecodes hydrangeae* Mitchell, 1956. Elisha Mitchell Sci. Soc., Jour. 72: 214. ♂.  
**illinoensis** (Robertson). Minn. and Ont. to New England, south to N. C.  
*Machacris illinoensis* Robertson, 1903. Ent. News 14: 107. ♀.  
**johnsonii** Lovell. Que. and N. B., south to N. C.  
*Sphecodes johnsonii* Lovell, 1909. Ent. News 20: 122. ♀.  
**kincaidii** Cockerell. Wash.  
*Sphecodes kincaidii* Cockerell, 1898. Acad. Nat. Sci. Phila., Proc. 50: 56. ♀.  
**knetschi** Cockerell. Ill. to New England, south to N. C.  
*Sphecodes knetschi* Cockerell, 1898. Amer. Ent. Soc., Trans. 25: 186. ♀, ♂.  
**lautipennis** Cockerell. Sask., N. D., Mont., Wash., Colo., Calif.  
*Sphecodes lautipennis* Cockerell, 1908. Entomologist 41: 60. ♂.  
**levis** Lovell and Cockerell. Minn. and Ont. to Maine, south to Tenn. and N. C.  
*Sphecodes levis* Lovell and Cockerell, 1907. Psyche 14: 105. ♀, ♂.  
**mandibularis** Cresson. Colo., Kans., N. Mex., Calif.  
*Sphecodes mandibularis* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 250. ♀.  
**manni** Cockerell. Wash.  
*Sphecodes manni* Cockerell, 1913. Ann. and Mag. Nat. Hist. (8) 11: 63. ♀.  
**millsi** Cockerell. Colo.  
*Sphecodes millsi* Cockerell, 1919. Ent. News 30: 288. ♂.  
**minor** Robertson. Alta. to Maine, south to N. C. and Miss.  
*Sphecodes minor* Robertson, 1898. Acad. Sci. St. Louis, Trans. 8: 45. ♀.  
**nigricans miguelensis** Timberlake. Calif. (San Miguel Island).  
*Sphecodes nigricans miguelensis* Timberlake, 1940. South. Calif. Acad. Sci., Bul. 39: 193. ♂.  
**nigricans nigricans** Timberlake. Calif.  
*Sphecodes nigricans* Timberlake, 1940. South. Calif. Acad. Sci., Bul. 39: 192. ♂.  
**nigricorpus** Mitchell. Conn. (Colebrook).  
*Sphecodes nigricorpus* Mitchell, 1956. Elisha Mitchell Sci. Soc., Jour. 72: 220. ♂.

**nitidissimus** Cockerell. Colo.

*Sphecodes (Sphecodium) nitidissimus* Cockerell, 1910. Canad. Ent. 42: 367. ♂.

**olympicus** Cockerell. Wash.

*Sphecodes (Drepanium) Olympicus* Cockerell, 1904. In Viereck, Canad. Ent. 36: 230. ♀.

**paraplesius** Lovell. R. I.

*Sphecodes paraplesius* Lovell, 1911. Ent. News 22: 212. ♀.

**patruelis** Cockerell. Wash. Predator: *Philanthus crabroniformis* Sm.

*Sphecodes patruelis* Cockerell, 1913. Ann. and Mag. Nat. Hist. (8) 11: 61. ♀, ♂.

**pecosensis pecosensis** Cockerell. Colo., N. Mex.

*Sphecodes pecosensis* Cockerell, 1904. Entomologist 37: 5. ♀.

*Proteraner leptanthi* Cockerell, 1904. Entomologist 37: 232. ♂.

Taxonomy: Cockerell, 1906. Canad. Ent. 38: 165. —Cockerell, 1909. Canad. Ent. 41: 219. ♀, ♂.

—Timberlake, 1951. In Muesebeck, Krombein and Townes, U. S. Dept. Agr., Agr. Monog. 2: 1122 (synonymy).

**pecosensis salicis** Cockerell. Calif.

*Sphecodes pecosensis salicis* Cockerell, 1922. Ann. and Mag. Nat. Hist. (9) 10: 547. ♀.

**perlustrans** Cockerell. N. Mex.

*Sphecodes perlustrans* Cockerell, 1898. Denison Univ. Sci. Labs., Bul. 11: 45. ♀.

Republished by Cockerell, 1898. N. Mex. Univ., Bul. 1: 45. female.

**persimilis** Lovell and Cockerell. Mich. to N. Y., R. I., Maine.

*Sphecodes persimilis* Lovell and Cockerell, 1907. Psyche 14: 103. ♀.

**pimpinellae** Robertson. Ill. to Kans. south to Va. and N. C. Host: *Augochlora persimilis* (Vier.), *A. striata* (Prov.).

*Sphecodes pimpinellae* Robertson, 1900. Acad. Sci. St. Louis, Trans. 10: 51. ♀.

*Sphecodes distolus* Lovell, 1909. Ent. News 20: 416. ♀.

Biology: Ordway, 1964. Kans. Ent. Soc., Jour. 37: 139-152, 5 figs. (parasitic relationships; probable male).

**politulus** Cockerell. Sask.

*Sphecodes politulus* Cockerell, 1937. Amer. Mus. Novitates 909: 3. ♂.

**prosporus** Lovell and Cockerell. Minn. to N. S., south to N. C.

*Sphecodes prosporus* Lovell and Cockerell, 1907. Psyche 14: 404. ♀, ♂.

**prostygus** Mitchell. N. H., Fla.

*Sphecodes prostygus* Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 499. ♀.

**pulsatillae** Cockerell. Colo.

*Sphecodes hesperellus pulsatillae* Cockerell, 1906. Ann. and Mag. Nat. Hist. (7) 18: 75. ♀.

**pusillus** Cockerell. Sask.

*Sphecodes pusillus* Cockerell, 1937. Amer. Mus. Novitates 909: 3. ♂.

**pycnanthemi** Robertson. Ill., Colo.

*Sphecodes pycnanthemum* Robertson, 1897. Acad. Sci. St. Louis, Trans. 7: 320. ♀.

**ranunculi** Robertson. Minn. to Maine, south to N. C., Kans., ?Ariz.

*Sphecodes ranunculi* Robertson, 1897. Acad. Sci. St. Louis, Trans. 7: 318. ♀, ♂.

**rhois** (Cockerell). Colo., N. Mex., Ariz., Mexico.

*Proteraner rhois* Cockerell, 1904. Entomologist 37: 233. ♂.

**rohweri** Cockerell. Colo., N. Mex.

*Sphecodes (Machaeris) Rohweri* Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 20: 450. ♀.

**semicoloratus** (Cockerell). N. Mex.

*Halictus semicoloratus* Cockerell, 1897. Amer. Ent. Soc., Trans. 24: 168. ♀.

**shawii** Lovell. N. H.

*Sphecodes shawii* Lovell, 1911. Ent. News 22: 212. ♀.

**smilacinae** Robertson. Minn., Ill.

*Sphecodes smilacinae* Robertson, 1897. Acad. Sci. St. Louis, Trans. 7: 321. ♀.

**solidaginis** Cockerell. Sask.

*Sphecodes solidaginis* Cockerell, 1937. Amer. Mus. Novitates 909: 2. ♂.

**solonis** Graenicher. Minn., Ont., and New England.

*Sphecodes solonis* Graenicher, 1910. Pub. Mus. City Milwaukee, Bul. 1: 229. ♂, ♀.

*Sphecodes morsei* Mitchell, 1956. Elisha Mitchell Sci. Soc., Jour. 72: 213. ♀.

*Sphecodes packardi* Mitchell, 1956. Elisha Mitchell Sci. Soc., Jour. 72: 216. ♂.

**sophiae** Cockerell. Colo., N. Mex., Ariz., Calif.

*Sphecodes sophiae* Cockerell, 1898 Denison Univ. Sci. Labs., Bul. 11: 44. ♀. Republished by Cockerell, 1898. N. Mex. Univ., Bul. 1: 44. female.

**stygius** Robertson. Minn. to Que. and New England, south to Fla.

*Sphecodes stygius* Robertson, 1893. Amer. Ent. Soc., Trans. 20: 145. ♀, ♂.

Taxonomy: Robertson, 1897. Acad. Sci. St. Louis, Trans. 7: 317. ♂, ♀.

**sulcatulus** Cockerell. Colo. Predator: *Philanthus crabroniformis* Sm.

*Sphecodes sulcatulus* Cockerell, 1906. Amer. Mus. Nat. Hist., Bul. 22: 426. ♀.

**texana** Cresson. Tex.

*Sphecodes texana* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 249. ♀, ♂.

**townesi** Mitchell. Mich. and N. Y. to N. C.

*Sphecodes townesi* Mitchell, 1956. Elisha Mitchell Sci. Soc., Jour. 72: 212. ♀.

**trentonensis** Cockerell. N. Y.

*Sphecodes trentonensis* Cockerell, 1913. Ann. and Mag. Nat. Hist. (8) 11: 62. ♀.

**veganus** Cockerell. N. Mex.

*Sphecodes veganus* Cockerell, 1904. Entomologist 37: 5. ♀.

**washingtoni** Cockerell. Wash.

*Sphecodes (Machaeris) Washingtoni* Cockerell, 1904. In Viereck, Canad. Ent. 36: 231. ♀.

**wheeleri** Mitchell. N. Y. and Conn., south to N. C., ?Kans. Probable male of *pimpinellae* Robt.

*Sphecodes wheeleri* Mitchell, 1956. Elisha Mitchell Sci. Soc., Jour. 72: 210. ♀, ♂.

#### UNPLACED TAXA OF TRIBE HALICTINI

The following species cannot be placed as to genus from existing descriptions.

*Halictus arcatus* Vachal, 1904. Soc. Hist. Arch. Correze, Bul. 26: 480. ♂. B. C.

*Parasphecodes Californica* Provancher, 1896. Nat. Canad. 23: 8. ♀. Calif.

*Halictus crassicornis* Kirby, 1837. In Richardson, Fauna Bor-Amer., v. 4, p. 267. ♀. Canada.

*Halictus distinguendus* Dalla Torre, 1896. Cat. Hym., v. 10, p. 60. N. name for *Halictus distinctus* Provancher, 1882. Nat. Canad. 13: 200. male. ?Que. Preocc.

### Family MELITTIDAE

With the exception of the subfamily Ctenoplectrinae which is restricted to the Ethiopian, Oriental and Australian regions, this family is represented in North America by three subfamilies also present in the Old World. None of these is known to occur in the Neotropical Region and only a few species of the Dasypodinae (Genus *Hesperapis*) are known to be present in northern Mexico. The generic relationships within this latter subfamily are in need of clarification especially those centering about the genus *Hesperapis*. On the basis of accumulated infrafloral information it appears that many, if not most, members of this family have evolved as oligoleges of both annual and perennial plants.

Taxonomy: Rozen and McGinley, 1974. Amer. Mus. Novitates 2545: 1-31, figs. 1-82, tables 1, 2 (larvae).

Biology: Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 32-33, fig. 13 (*Larrea* visiting spp.).

#### SUBFAMILY MELITTINAE

##### Genus MELITTA Kirby

##### Genus MELITTA Subgenus MELITTA Kirby

*Melitta* Kirby, 1802. Monographia Apum Angliae, v. 1, p. 117.

Type-species: *Melitta tricolor* Kirby. Desig. by Richards, 1935.

*Cilissa* Leach, 1812. In Brewster's Edinburgh Encycl., v. 9, p. 154.

Type-species: *Andrena haemorrhoidalis* Fabricius. Desig. by Westwood, 1840.

*Kirbya* Lepeletier, 1841. Hist. Nat. Ins. Hym., v. 2, p. 145. Preocc.

Type-species: *Melitta tricineta* Kirby. Desig. by Sandhouse, 1943.

*Melitta* subg. *Brachycephalapis* Viereck, 1909. Ent. Soc. Wash., Proc. 11: 47.

Type-species: *Melitta californica* Viereck. Monotypic and orig. desig.

*americana* (Smith). Maine to Ga., Miss. Pollen: Unknown, but visits flowers of *Polycodium* and *Rubus*.

*Cilissa americana* Smith, 1853 Cat. Hym. Brit. Mus., v. 1, p. 123. ♀.

Taxonomy: Cockerell, 1906. Psyche 13: 5. ♀.

*americaniformis* Viereck. N. J.

*Melitta americaniformis* Viereck, 1909. Ent. Soc. Wash., Proc. 11: 50. ♀.

*wilmattae* Cockerell. Ariz., Calif. Pollen: Unknown, but visits flowers of *Coreopsis* and *Larrea*.

*Melitta wilmattae* Cockerell, 1937. Amer. Mus. Novitates 948: 3. ♀.

### Genus MELITTA Subgenus DOLICHOCHILE Viereck

*Dolichochile* Viereck, 1909. Ent. Soc. Wash., Proc. 11: 49.

Type-species: *Dolichochile melittoides* Viereck. Monotypic and orig. desig.

*melittoides* (Viereck). Conn. to Ga., Tenn. Pollen: Unknown, but visits flowers of *Polycodium*, *Xolisma* and *Zenobia*.

*Dolichochile melittoides* Viereck, 1909. Ent. Soc. Wash., Proc. 11: 49. ♀.

Taxonomy: Cockerell, 1911. Ann. and Mag. Nat. Hist. (8) 8: 692.

### SUBFAMILY DASYPODINAE

### Genus HESPERAPIS Cockerell

Revision: Cockerell, 1916. Psyche 23: 176-177.

### Genus HESPERAPIS Subgenus HESPERAPIS Cockerell

*Hesperapis* Cockerell, 1898. Canad. Ent. 30: 147.

Type-species: *Hesperapis elegantula* Cockerell. Monotypic.

*Zacesta* Ashmead, 1899. Amer. Ent. Soc., Trans. 26: 73.

Type-species: *Zacesta rufipes* Ashmead. Monotypic and orig. desig.

*arida* Michener. Ariz., south. Calif., desert. Pollen: Oligolectic on flowers of *Larrea tridentata*.

Biology: Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 32-33 (floral relationships).

*Hesperapis arida* Michener, 1936. Ent. News 47: 183. ♂, ♀.

*elegantula* Cockerell. N. Mex.

*Hesperapis elegantula* Cockerell, 1898. Canad. Ent. 30: 148. ♀.

*rufipes* (Ashmead). South. Calif. Pollen: Oligolectic on flowers of *Hugelia*.

*Zacesta rufipes* Ashmead, 1899. Amer. Ent. Soc., Trans. 26: 73. ♂.

Taxonomy: Michener, 1936. Ent. News 47: 182. ♂, ♀. —Michener, 1953. Kans. Univ. Sci. Bul. 35: 1040, figs. 281-287 (larva).

### Genus HESPERAPIS Subgenus AMBLYAPIS Cockerell

*Amblyapis* Cockerell, 1910. Ann. and Mag. Nat. Hist. (8) 5: 362.

Type-species: *Halictoides ilicifoliae* Cockerell. Monotypic and orig. desig.

*ilicifoliae* (Cockerell). Calif. Pollen: Oligolectic on flowers of *Adenostoma*.

*Halictoides ilicifoliae* Cockerell, 1910. Ann. and Mag. Nat. Hist. (8) 5: 361. ♂.

### Genus HESPERAPIS Subgenus PANURGOMIA Viereck

*Panurgomia* Viereck, 1909. Ent. Soc. Wash., Proc. 11: 48.

Type-species: *Panurgomia fuchsi* Viereck. Monotypic.

- arenicola** Crawford. Ariz., Nev., Calif. deserts; Mexico. Pollen: Oligolectic on spring flowering Compositae including but apparently not limited to *Dyssodia*, *Encelia*, *Geraea*, *Helianthus*, and *Rafinesquia*.  
*Hesperapis arenicola* Crawford, 1917. Ent. Soc. Wash., Proc. 19: 167. ♂.
- carinata carinata** Stevens. N. Dak., Idaho.  
*Hesperapis carinata* Stevens, 1919. Canad. Ent. 51: 209. ♂.  
 Taxonomy: Stevens, 1921. Canad. Ent. 53: 65. ♀.
- carinata rodecki** Cockerell. Colo.  
*Hesperapis carinata rodecki* Cockerell, 1934. Canad. Ent. 66: 153. ♀.
- eumorpha** (Cockerell). Calif.  
*Parandrena eumorpha* Cockerell, 1898. Amer. Ent. Soc., Trans. 25: 187. ♂.  
*Hesperapis eumorpha* Cockerell, 1902. South. Calif. Acad. Sci., Bul. 1: 70. Emend.
- fuchsi** (Viereck). Ariz.  
*Panurgonia fuchsi* Viereck, 1909. Ent. Soc. Wash., Proc. 11: 49. ♀.  
 Taxonomy: Cockerell, 1911. Ann. and Mag. Nat. Hist. (8) 8: 671.
- fulvipes** Crawford. Calif., deserts. Pollen: Oligolectic on flowers of *Geraea canescens*.  
*Hesperapis fulvipes* Crawford, 1917. Ent. Soc. Wash., Proc. 19: 166. ♂.  
 Biology: Hurd, 1957. Kans. Ent. Soc., Jour. 30: 10 (seasonal synchronization with pollen source).
- larreae** Cockerell. Tex. to Utah and South. Calif. deserts; Mex. Pollen: Oligolectic on flowers of *Larrea tridentata*.  
*Hesperapis larreae* Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 19: 535. ♂.  
 Biology: Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 33, fig. 13 (floral relationships).
- laticeps** Crawford. Calif. deserts and adjacent Nev. and Ariz. Pollen: Oligolectic on flowers of *Mentzelia*.  
*Hesperapis laticeps* Crawford, 1917. Ent. Soc. Wash., Proc. 19: 166. ♂.
- leucura** Cockerell. Calif.; Mexico (Baja California). Pollen: Possibly oligolectic on flowers of *Dalea*, but is known to visit flowers of *Cryptantha*.  
*Hesperapis leucurus* Cockerell, 1916. Pomona Jour. Ent. Zool. 8: 44. ♂.
- nitidula** Cockerell. Calif.; Mexico (Baja California). Pollen: Oligolectic on flowers of *Oenothera*.  
*Hesperapis nitidulus* Cockerell, 1916. Pomona Jour. Ent. Zool. 8: 45. ♂.  
 Taxonomy: Cockerell, 1941. San Diego Soc. Nat. Hist., Trans. 9: 348. ♀.
- oliviae** (Cockerell). N. Mex.  
*Panurgus oliviae* Cockerell, 1897. Amer. Ent. Soc., Trans. 24: 149. ♂.
- parva** Michener. Calif. deserts; Mexico. Pollen: Unknown, but visits flowers of *Acacia*, *Cryptantha*, *Eriogonum*, *Eschscholzia*, *Oenothera*, and *Phacelia*.  
*Hesperapis parva* Michener, 1937. Ann. and Mag. Nat. Hist. (10) 19: 327. ♂, ♀.
- pellucida** Cockerell. Calif. Pollen: Oligolectic on flowers of *Eschscholzia californica*.  
*Hesperapis pellucidus* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 198. ♂.
- regularis** (Cresson). Calif. Pollen: Oligolectic on flowers of *Clarkia*.  
*Panurgus regularis* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 62. ♀.  
 Biology: Burdick and Torchio, 1959. Kans. Ent. Soc., Jour. 32: 83-87, 7 figs. — MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 70: 16-20 (floral relationships).
- rhodocerata** (Cockerell). N. Mex., Calif.  
*Panurgus rhodoceratus* Cockerell, 1897. Amer. Ent. Soc., Trans. 24: 148. ♀, ♂.
- semirudis** Cockerell. Calif. Pollen: Appears to be oligolectic on vernal flowering Compositae including *Chaenactis*, *Coreopsis*, *Layia*, and *Malacothrix*.  
*Hesperapis semirudis* Cockerell, 1910. Ann. and Mag. Nat. Hist. (8) 5: 24. ♀.
- wilmattae** Cockerell. Calif., Ariz., Nev. deserts. Pollen: *Chaenactis*, *Encelia*, *Malacothrix*, *Oenothera*, *Rafinesquia*, *Sphaeralcea* and *Tetradymia*, but also visits a wide variety of



other flowers including *Abronia*, *Astragalus*, *Baileya*, *Calycoseris*, *Cryptantha*, *Eriophyllum*, *Eschscholzia*, *Geraea*, *Malva*, *Nama*, and *Phacelia* for nectar.  
*Hesperapis wilmattae* Cockerell, 1933. Pan-Pacific Ent. 9: 26. ♀.

Taxonomy: Michener, 1936. Ent. News 47: 184. ♂.

#### SUBFAMILY MACROPIDINAE

##### Genus MACROPIS Panzer

Revision: Michener, 1938. Psyche 45: 133-135.

##### Genus MACROPIS Subgenus MACROPIS Panzer

*Megilla* Fabricius, 1804. Systema Piezatorum, p. 328.

Type-species: *Megilla labiata* Fabricius. Desig. by Westwood, 1840.

*Macropis* Panzer, 1809. Faunae Ins. German., h. 107, No. 16.

Type-species: *Megilla labiata* Fabricius. Monotypic.

This is the only subgenus present in North America, and all of the species are believed to be oligolectic on flowers of *Steironema*.

*ciliata* Patton. Wis. to Que. and Maine south to Ga. Pollen: Unknown, but visits flowers of *Apocynum*, *Houstonia*, and *Hydrangea*.

*Macropis ciliata* Patton, 1880. Ent. Monthly Mag. 17: 31. ♀.

*clypeata* Swenk. Nebr.

*Macropis clypeata* Swenk, 1907. Ent. News 18: 293. ♂.

*longilingua* Provancher. Que.

*Macropis longilingua* Provancher, 1888. Addit. Corr. Faune Ent. Canada, Hym., p. 424. ♀.

*nuda* (Provancher). Colo., Mont., and south. Canada to N. Y., New England States and N. S.

Pollen: Unknown, but has been taken at flowers of *Apocynum*, *Geranium*, *Rubus*, and *Vaccinium*.

*Eucera nuda* Provancher, 1882. Nat. Canad. 13: 174. ♀.

*Macropis* (*Macropis*) *morsei* Robertson, 1897. Acad. Sci. St. Louis, Trans. 7: 338. ♂, ♀.

Taxonomy: Mitchell, 1960. N. C. Agr. Expt. Sta. Tech. Bul. 141: 527 (tax. status, synonymy).

*patellata* Patton. Vt. to N. C., west to Nebr., and Mo. Pollen: Oligolectic on flowers of *Steironema*.

*Macropis patellata* Patton, 1880. Ent. Monthly Mag. 17: 33. ♂.

*steironematis opaca* Michener. Wash.

*Macropis steironematis opaca* Michener, 1938. Psyche 45: 134. ♂.

*steironematis steironematis* Robertson. Iowa and Mo. to Va., N. C., and Ga. Pollen:

Presumably oligolectic on flowers of *Steironema*, but has been taken at flowers of *Apocynum*, *Ceanothus*, *Melilotus*, and *Serriocarpus*.

*Macropis steironematis* Robertson, 1891. Amer. Ent. Soc., Trans. 18: 63. ♀, ♂.

#### Family MEGACHILIDAE

This is one of the largest families of bees and is represented by about an equal number of species in each of the six zoogeographic regions. It is morphologically the most uniform and discrete familial assemblage within the Apoidea. While many of the characteristics of this family are shared with other families of bees and to a lesser extent with the Sphecoidea, the Megachilidae also possess many characteristics in common with the Scolioidea.

The family is composed of three subfamilies, the Fidelinae and Lithurginae which are all pollen-collecting bees, and the Megachilinae which are predominantly pollen-collecting species, but which contain several genera that are cleptoparasitic mainly in the nests of other megachilids. The Fidelinae are found only in Chile and South Africa, but both of the other subfamilies are nearly cosmopolitan and are well represented in America north of Mexico. Most of the pollen-collecting species do not make their own burrows, but appropriate a wide variety of pre-existing burrows, holes, shells and other cavities or construct their nests either in the open

attaching them to branches and so forth, or place them under stones, cow chips and so on. As a consequence of these habits, many species readily accept artificial nesting devices, and this has not only permitted detailed studies of their biology, but has also made possible the manipulation and management of several species for use in the pollination of agricultural crops. However, some species in certain genera (e.g., *Megachile*) and even some groups of species (e.g., *Heteranthidium* and *Trachusa*) do construct their own burrows. All of the pollen-collecting Megachilidae use foreign materials in the construction of the cell walls. These materials include leaves, plant down, leaf pulp, petals, resin, pebbles, mud, clay, and the like. The larvae spin tough cocoons before pupation.

Apart from the cleptoparasitic species, many of the megachilids are highly restricted in their intrafloral relationships and thus oligolecty is a relatively common phenomenon in this family.

Revision: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 5-232, 1 frontis., figs. 1-66, tables 1-7 (eastern U. S. spp.).

Taxonomy: Rozen, 1973. Amer. Mus. Novitates 2527: 1-14, 22 figs. (immature stages).

Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 264-344, figs. (life histories, nests, associates). —Eickwort, 1975. Evolution 29: 142-150, 1 fig., 2 tables (gregarious nesting, and evolution of parasitism and sociality among megachilid bees).

Morphology: Pasteels and Pasteels, 1972. Acad. Roy. Belgique, Mem. Classe Sci. 18: 1-28, 3 pls. (cuticular hairs). —Pasteels and Pasteels, 1973. Tissue and Cell 5: 63-82 (morphogenetic fields of hairs on legs). —Pasteels and Pasteels 1974. Tissue and Cell 6: 65-83 (Stereoscan studies of abdominal scopae).

#### SUBFAMILY LITHURGINAE

Taxonomy: Rozen, 1973. Amer. Mus. Novitates 2527: 1-14, 22 figs. (immature stages).

#### Genus LITHURGE Latreille

##### Genus LITHURGE Subgenus LITHURGE Latreille

*Lithurge* Latreille, 1825. Fam. Nat. Regne Anim., p. 463.

Type-species: *Andrena cornuta* Fabricius. Monotypic.

*Lithurgus* Berthold, 1827. In Latreille, Nat. Fam. Thierr., p. 467. Emend.

Found in the Old World.

##### Genus LITHURGE Subgenus LITHURGOPSIS Fox

*Lithurgopsis* Fox, 1902. Ent. News 13: 138.

Type-species: *Lithurgus apicalis* Cresson. Orig. desig.

Revision: Mitchell, 1938. Psyche 45: 146-155. (Nearctic spp.).

*apicalis apicalis* (Cresson). S. Dak., Nebr., Kans., Tex., Wyo., Utah, Colo., N. Mex., Ariz., Nev., east. Calif. principally from Transit. Zone. Ecology: Nests have been found in holes of an old, barkless, cottonwood log in Utah; it also is reported to construct its nests in the doorways of homes in Arizona. Parasite: *Anthrax cinalapa* Cole. Pollen: Oligolectic, stores pollen of *Opuntia*, but visits other flowers presumably for nectar including *Echinocactus*, *Encelia californica*, *Eriogonum*, *Sphaeralcea*.

*Lithurgus apicalis* Cresson, 1875. In Wheeler, Rpt. Geog. Geol. Expl. and Surv. west of 100th Meridian, v. 5, p. 724. ♀.

Taxonomy: Rozen, 1973. Amer. Mus. Novitates 2527: 6-8, figs. 13-18 (larva).

Biology: Parker and Potter, 1973. Pan-Pacific Ent. 49: 294-299, 19 figs. (nest, larval habits, parasite).

*apicalis littoralis* (Cockerell). South Tex. (Point Isabel; near Brownsville).

*Lithurgus apicalis littoralis* Cockerell, 1917. In W. P. Cockerell, N. Y. Ent. Soc. Jour. 25: 191. ♂.

- apicalis opuntiae** (Cockerell). Colo., N. Mex., Tex., Ariz., Calif.; north. Mexico, principally from Sonoran Zone. Pollen: Oligolectic, presumably collects pollen from flowers of *Opuntia* including *O. echinocarpa*, *O. megacarpa*, *O. vaseyi*, but visits other flowers for nectar.  
*Lithurgus apicalis* var. *opuntiae* Cockerell, 1902. Ent. News 13: 182.
- arizonensis** (Cockerell). Ariz.  
*Lithurgus arizonensis* Cockerell, 1937. South. Calif. Acad. Sci., Bul. 36: 108. ♀.
- bruesi** (Mitchell). Ill. to Tex.; Mexico.  
*Lithurgus bruesi* Mitchell, 1927. Psyche 34: 104. ♂.
- echinocacti** (Cockerell). N. Mex., Ariz.; Mexico (Baja California and Sonora). Ecology: Nests in rotten wood. Pollen: Presumably oligolectic, visits flowers of *Echinocactus*.  
*Lithurgus echinocacti* Cockerell, 1898. Ann. and Mag. Nat. Hist. (7) 2: 453. ♀.
- gibbosus** (Smith). N. C., to Fla., Tex. Pollen: Oligolectic, collects pollen from flowers of *Opuntia*, but visits other flowers, presumably for nectar including *Cirsium*, *Helianthus*, *Ilex*, *Pontederia*, *Rudbeckia*.  
*Lithurgus gibbosus* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 147. ♀.  
*Lithurgus compressus* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 147. ♂.

## SUBFAMILY MEGACHILINAE

This is a large group of mostly pollen-collecting species which are present on all the continents and many of the islands. The subfamily is composed of two tribes, the Anthidiini and the Megachilini, both of which are well represented by numerous species in America north of Mexico.

## TRIBE ANTHIDIINI

Although this tribe is present throughout much of the world, it contains fewer species than the Megachilini and, unlike that tribe, is represented by only a single species in Australia. Like the Megachilini the pollen-collecting species use a wide variety of foreign materials in constructing their nest cells, but are not known to use mud. While the majority of the Anthidiini are solitary, some of the pollen-collecting species in certain genera (e. g., *Heteranthidium* and *Trachusa*) live in colonies.

Revision: Michener, 1948. Amer. Mus. Novitates 1381: 1-29 (generic classification).

Taxonomy: Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 1-113, 229 figs., 41 maps (Calif. spp.). — Pasteels, 1969. Soc. Roy. Ent. Belgique, Mem. 31: 1-148, 199 figs. (classification). — Pasteels, 1972. Soc. Roy. Ent. Belgique, Bul. Ann. 108: 72-128, 107 figs. (classification).

Biology: Custer and Hicks, 1927. Biol. Bul. 52: 258-277 (nesting habits).

## Genus TRACHUSA Panzer

*Trachusa* Panzer, 1804. Faunae Ins. German., pt. 86, nos. 14-15.

Type-species: *Apis byssina* Panzer. Desig. by Sandhouse, 1943. (= *Trachusa serratulae* Panzer).

*Diphysis* Lepeletier, 1841. Hist. Nat. Ins., Hym., v. 2, p. 307.

Type-species: *Apis byssina* Panzer. Monotypic. (= *Diphysis pyrenaica* Lepeletier).

*Trachusomimus* Popov, 1964. Rev. Ent. URSS 43: 406.

Type-species: *Trachusa perdita* Cockerell. Orig. desig.

The genus also occurs in the Palaearctic Region.

Revision: Michener, 1941. Pan-Pacific Ent. 17: 119-125. (Nearctic spp.).

Taxonomy: Michener, 1953. Kans. Univ. Sci. Bul. 5: 1041 (larva). — Thorp, 1963. Pan-Pacific Ent. 39: 56-58 (Key to spp. of *Trachusa*). — Thorp, 1966. Kans. Ent. Soc., Jour. 39: 132 (generic status of *Trachusomimus* Popov). — Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 4-6, figs. 1, 129-134, map 1 (Calif. spp.).

**gummifera** Thorp. Calif. (Marin and San Francisco Counties).

*Trachusa gummifera* Thorp, 1963. Pan-Pacific Ent. 39: 56. ♀, ♂.

- manni** Crawford. South Ariz., north. Mexico. Parasite: *Heterostelis manni* Cwfd.? *Trachusa manni* Crawford, 1917. Ent. Soc. Wash., Proc. 19: 167. ♂.
- perdita** Cockerell. Calif. Parasite: *Heterostelis hurdi* Thorp, *Nemognatha scutellaris* LeC. Pollen: Presumably polylectic, visits flowers of *Brodiaea lutea*, *Clarkia cylindrica*, *C. purpurea quadrivulnera*, *C. speciosa speciosa*, *Collinsia heterophylla*, *Convolvulus*, *Eriodictyon californicum*, *Eriophyllum confertiflorum*, *Layia platyglossa campestris*, *Lotus scoparius*, *Lupinus nanus*, *Penstemon antirrhinoides*, *P. heterophyllus*, *Salvia columbariae*.  
*Trachusa perdita* Cockerell, 1904. South. Calif. Acad. Sci., Bul. 3: 159. ♂.
- Biology: Michener, 1941. Pan-Pacific Ent. 17: 123 (nest). —Thorp, 1966. Kans. Ent. Soc., Jour. 39: 132 (parasite). —MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 70: 49 (floral relationships).
- Genus HETERANTHIDIUM Cockerell**
- Heteranthidium* Cockerell, 1904, Ent. News 15: 292.  
Type-species: *Anthidium dorsale* Lepeletier. Monotypic and orig. desig.
- Taxonomy: Schwarz, 1926. Amer. Mus. Novitates 218: 1-15 (U. S. spp.). —Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 23-31, figs. 8-10, table 1 (eastern U. S. spp.). —Snelling, 1966, Los Angeles County Mus. Contrib. Sci. 97: 1-8, 1 fig. (Key to U. S. spp.). —Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 6-10, figs. 111-128, maps 2-5 (Calif. spp.).
- autumnale** Snelling. Calif. (Desert Hot Springs); Mexico (Baja California). Pollen: Unknown, but presumably visits flowers of *Chrysothamnus* or *Haplopappus*.  
*Heteranthidium autumnale* Snelling, 1966. Los Angeles County Mus. Contrib. Sci. 97: 1, fig. 1. ♂, ♀.
- Taxonomy: Snelling, 1975. Ent. Soc. Wash., Proc. 77: 90 (color variation in Baja Calif. specimen).
- bequaerti** Schwarz. South. Calif. (Colorado Desert). Pollen: Oligolege of *Dalea spinosa*.  
*Heteranthidium bequaerti* Schwarz, 1926. Amer. Mus. Novitates 218: 6. ♀.
- cordaticeps** Michener. Tex., N. Mex. Ariz. Pollen: Unknown, but visits flowers of *Helianthus annuus*, also possibly *Heterotheca subaxillaris*.  
*Heteranthidium cordaticeps* Michener, 1949. Kans. Ent. Soc., Jour. 22: 41. ♀.
- Taxonomy: Snelling, 1975. Ent. Soc. Wash., Proc. 77: 87-88, fig. 1 (male, geogr. and floral records).
- crassipes** (Cresson). N. C. to Fla.  
*Anthidium crassipes* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 112. ♀.
- dorsale** (Lepeletier). N. J., N. C., Ga., Ala. Pollen: Unknown, but visits flowers of *Strophostyles*.  
*Anthidium dorsale* Lepeletier, 1841. Hist. Nat. Ins., Hym., v. 2, p. 384. ♂.  
*Anthidium harbecki* Crawford, 1910. Ent. News 21: 456. ♀.
- Taxonomy: Cresson, 1864. Ent. Soc. Phila., Proc. 2: 381. ♂.
- fontemviteae** Schwarz. N. C. to Fla. Pollen: Unknown, but visits flowers of *Chrysopsis*, *Kuhnistera*.  
*Heteranthidium fontemviteae* Schwarz, 1926. Amer. Mus. Novitates 218: 8. ♂, ♀.
- larreae** (Cockerell). West. Tex. to south. Utah, Nev. and south. Calif. (Sonoran and Mojave deserts); Mexico. Pollen: Oligolege of *Larrea tridentata*, but visits other flowers for nectar including *Baileya*, *Machaeranthera tortifolia*, *Salvia dorri*, *Senecio douglasii*.  
*Anthidium larreae* Cockerell, 1897. Canad. Ent. 29: 220. ♀, ♂.
- Biology: MacSwain, 1946. Pan-Pacific Ent. 22: 159. (nesting habits). —Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 34, fig. 14 (intrafloral relationships).
- occidentale** (Cresson). Colo., N. Mex.; Mexico (Puebla).  
*Anthidium occidentale* Cresson, 1868. Amer. Ent. Soc., Trans. 1: 386. ♀, ♂.
- ridingsii** (Cresson). N. C. to Fla. and Tex. Pollen: Unknown, but visits flowers of *Crotalaria*, *Galactia*, *Hypericum*, *Melilotus*, *Rhus*.  
*Anthidium ridingsii* Cresson, 1878. Amer. Ent. Soc., Trans. 7: Proc. iii. ♀.

**timberlakei** Schwarz. South. Oreg., Calif., west. Nev. Pollen: Polylectic, visits flowers of *Chaenactis douglasii*, *C. glabriuscula*, *Cirsium*, *Clarkia biloba*, *C. concinna*, *C. cylindrica*, *C. gracilis*, *Coreopsis lanceolata*, *Encelia farinosa*, *Helianthus gracilentus*, *Salvia mellifera*.

*Heteranthidium timberlakei* Schwarz, 1928. N. Y. Ent. Soc., Jour. 36: 409. ♂, ♀.

*Heteranthidium subtimberlakei* Schwarz, 1928. N. Y. Ent. Soc., Jour. 36: 414. ♀.

Taxonomy: Stephen and Torchio, 1961. Pan-Pacific Ent. 37: 41-43 (as *zebratum*). —Snelling, 1966. Los Angeles County Mus. Contrib. Sci. 97: 5 (synonymy).

Biology: MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 70: 49 (floral relationships).

**zebratum** (Cresson). Mich. south to Miss., west to S. Dak., Nebr., Colo. and N. Mex. Pollen:

Unknown, but visits flowers of *Gaillardia*, *Helianthus*.

*Anthidium zebratum* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 270. ♂.

*Proanthidium cockerelli* Titus, 1902. Ent. News 13: 170. ♂.

*Anthidium* (*Proanthidium*) *Chippewaense* Graenicher, 1910. Canad. Ent. 42: 157. ♂, ♀.

*Heteranthidium zebratum mississippi* Michener, 1937. Amer. Midland Nat. 38: 449. ♂, ♀.

Taxonomy: Snelling, 1966. Los Angeles County Mus. Contrib. Sci. 97: 4-5 (synonymy).

### Genus PARANTHIDIUM Cockerell and Cockerell

#### Genus PARANTHIDIUM Subgenus PARANTHIDIUM Cockerell and Cockerell

*Anthidium* subg. *Paranthidium* Cockerell and Cockerell, 1901. Ann. and Mag. Nat. Hist. (7) 7: 50.

Type-species: *Paranthidium jugatorium perpictum* (Cockerell). Orig. desig.  
(=*Anthidium perpictum* Cockerell).

Taxonomy: Schwarz, 1926. Amer. Mus. Novitates 226: 19-25 (N. Amer. spp.). —Moure, 1965. Ent. Soc. Wash., Proc. 67: 29-31 (generic limits).

**jugatorium butleri** Snelling. Ariz. Pollen: Unknown, but visits flowers of *Erigeron*, *Helianthus*.

*Paranthidium jugatorium butleri* Snelling, 1962. Pan-Pacific Ent. 38: 225. ♀, ♂.

**jugatorium jugatorium** (Say). N. Y., N. J., Ind., Minn., Wis., Mo., Nebr. Parasite: *Dasyutilla asopus bezar* (Blake). Pollen: Unknown, but visits flowers of *Helianthus strumosus*.

*Megachile jugatoria* Say, 1824. In Keating, Narr. Long's 2nd Exped., v. 2, p. 352. ♀.

*Stelis obesa* Say, 1837. Boston Jour. Nat. Hist. 1: 398. ♂.

Biology: Michener, 1975. Kansas Ent. Soc., Jour. 48: 194-200 (nest, parasite).

**jugatorium lepidum** (Cresson). Ky. and Va., south to Ga. Pollen: Unknown, but visits flowers of *Helenium*, *Helianthus*, *Rudbeckia*, *Silphium*.

*Anthidium lepidum* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 115. ♂.

**jugatorium perpictum** (Cockerell). Colo., N. Mex., Ariz.

*Anthidium perpictum* Cockerell, 1898. Denison Univ. Sci. Labs., Bul. 11: 63. ♀.

*Anthidium* (*Dianthidium*) *perpictum coloradense* Swenk, 1914. Nebr. Univ., Studies 14: 32. ♀.

Taxonomy: Cockerell, 1898. N. Mex. Univ., Bul. 1: 63. ♀. —Cockerell, 1900. Ann. and Mag. Nat. Hist. (7) 5: 413. ♂, ♀.

Biology: Banks, 1902. N. Y. Ent. Soc., Jour. 10: 213 (nesting habits).

#### Genus PARANTHIDIUM Subgenus MECANTHIDIUM Michener

*Paranthidium* subg. *Mecanthidium* Michener, 1942. N. Y. Ent. Soc., Jour. 50: 278.

Type-species: *Paranthidium* (*Mecanthidium*) *sonorum* Michener. Orig. desig.

Taxonomy: Moure, 1965. Ent. Soc. Wash., Proc. 67: 30 (systematic position).

**sonorum** Michener. Ariz., northern Mexico.

*Paranthidium* (*Mecanthidium*) *sonorum* Michener, 1942. N. Y. Ent. Soc., Jour. 50: 278. ♂, ♀.

## Genus ADANTHIDIUM Moure

*Adanthidium* Moure, 1965. Ent. Soc. Wash., Proc. 67: 29.

Type-species: *Anthidium texanum* Cresson. Orig. desig.

*arizonicum* (Rohwer). Ariz.

*Dianthidium arizonicum* Rohwer, 1916. Ent. Soc. Wash., Proc. 18: 192. ♂.

Biology: Middleton, 1916. Ent. Soc. Wash., Proc. 18: 193 (nest).

*texanum* (Cresson). Kans., Ariz., Tex.

*Anthidium texanum* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 113. ♂.

Biology: Melander, 1902. Biol. Bul. 3: 27 (nest).

## Genus ANTHIDIUM Fabricius

## Genus ANTHIDIUM Subgenus ANTHIDIUM Fabricius

*Anthidium* Fabricius, 1804. Systema piezatorum, p. 364.

Type-species: *Apis manicata* Linnaeus. Desig. by Latreille, 1810.

Taxonomy: Swenk, 1913. Nebr. Univ., Studies 14: 9-18 (Nebr. spp.). —Cockerell, 1925. Calif.

Acad. Sci., Proc. (4) 14: 345-361 (western U. S. spp.). —Schwarz, 1927. Amer. Mus.

Novitates 252: 1-22; 253: 1-17 (N. Amer. spp.). —Mitchell, 1962. N. C. Agr. Expt. Sta. Tech.

Bul. 152: 9-13, figs. 1, 3, table 1 (eastern U. S. spp.). —Grigarick and Stange, 1968. Calif.

Ins. Survey, Bul. 9: 10-35, figs. 3, 7-100, 214, 217-220, maps 6-24 (Calif. spp.).

Biology: Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 11 (summary of literature).

*atripes* Cresson. Tex., Colo., Nev., and Calif. Pollen: Apparently narrowly polylectic, visits flowers of *Astragalus* including *A. douglasii* var. *parishii*, *Lotus* including *L. strigosus* var. *hirtellus*.

*Anthidium emarginatum* var. *atripes* Cresson, 1879. Amer. Ent. Soc., Trans. 7: 205. ♂.

*Anthidium polingae* Schwarz, 1931. N. Y. Ent. Soc., Jour. 39: 315. ♀, ♂.

Taxonomy: Schwarz, 1928. N. Y. Ent. Soc., Jour. 36: 388. ♀. —Schwarz, 1937. N. Y. Ent. Soc., Jour. 45: 377.

*banningense* Cockerell. Wash., Utah, Oreg., Calif. Ecology: Nests in ground and uses down-like nesting materials from *Artemisia* and *Cirsium*. Parasite: *Chrysis florissanticola* Roh. Pollen: Apparently oligolectic on *Phacelia* including *P. heterophylla*, *P. imbricata*, *P. leucophylla*, *P. ramosissima*, but also visits other flowers presumably for nectar including *Chaenactis glabriuscula*, *Clarkia amoena*, *Cryptantha*, *Lotus davidsonii*, *Medicago*, *Melilotus*, *Oenothera*, *Physocarpus*, *Trifolium wormskioldii*.

*Anthidium banningense* Cockerell, 1904. South. Calif. Acad. Sci. Proc. 3: 58. ♂.

*Anthidium plumarium* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 356. ♂.

*Anthidium longispinum* Schwarz, 1927. Amer. Mus. Novitates 253: 6. ♀.

Biology: Jaycox, 1967. Kans. Ent. Soc., Jour. 40: 565-570 (territoriality, pollen source).

*clypeodentatum* Swenk. Man. to B. C., Nebr., Colo., Calif. Pollen: Apparently narrowly polylectic, presumably obtains pollen from Leguminosae including *Astragalus douglasii* var. *parishii*, *Lotus davidsonii*, *L. oblongiflorus*, *Lupinus*, but also visits other flowers for nectar including *Ceanothus*, *Cryptantha intermedia*, *Phacelia frigida*.

*Anthidium clypeodentatum* Swenk, 1914. Nebr. Univ., Studies 14: 12. ♀.

*Anthidium incurvatum* Swenk, 1914. Nebr. Univ., Studies 14: 22. ♂.

*Anthidium emarginatum bilineatum* Schwarz, 1927. Amer. Mus. Novitates 252: 4. ♂.

*Anthidium clypeodentatum* var. *lutzi* Schwarz, 1928. N. Y. Ent. Soc., Jour. 36: 380. ♀, ♂.

Taxonomy: Schwarz, 1928. Canad. Ent. 60: 215. —Schwarz, 1937. N. Y. Ent. Soc., Jour. 45: 380 (*lutzi*). —Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 15-16, figs. 16-18, 68, 70, 91, map 8 (synonymy).

*cockerelli* Schwarz. West. Tex. to south. Nev. and south. Calif.; Mexico (Baja California).

Pollen: Polylectic, visits flowers of *Abronia villosa*, *Cercidium floridum*, *Chaenactis carphoclinia*, *Dalea californica*, *D. emoryi*, *Encelia*, *Eschscholzia darwinensis*, *Geraea*

*canescens*, *Larrea tridentata*, *Lupinus*, *Malacothrix*, *Palafoxia linearis*, *Phacelia crenulata*, *P. distans*, *Trifolium*, *Oenothera clavaeformis* var. *auriantica*.  
*Anthidium cockerelli* Schwarz, 1928. N. Y. Ent. Soc., Jour. 36: 386. ♂.

Taxonomy: Cockerell, 1937. Amer. Mus. Novitates 948: 6. ♀.

Biology: Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 35 (floral relationship with *Larrea*).

**collectum** Hurd. Calif. (including Channel Islands); Mexico (Baja California). Ecology: Nests in abandoned burrows in the ground, and uses down from the leaves and along the stem of *Artemisia tridentata*. Parasite: *Chrysis cognata* Bohart, *C. coloradica* Bohart, *C. tripartita* Aaron, *Dioxys pomonae* Ckll., *D. productus cismontanicus* Hurd, *Monodontomerus montivagus* Ashm., *Sphaerophthalma blakei* (Fox), *S. orestes* (Fox), *S. unicolor* (Cress.). Pollen: Polylectic, especially on *Lotus*, *Phacelia*, *Cryptantha*, but visits a wide variety of flowers presumably for nectar and/or pollen including *Amsinckia intermedia*, *Astragalus tener*, *Chaenactis glabriuscula*, *Cryptantha intermedia*, *Dudleya*, *Encelia farinosa*, *Eriastrum pluriflorum*, *Erodium botrys*, *Gilia*, *Lotus argyrophyllus*, *L. corniculatus*, *L. davidsonii*, *L. glaber*, *L. hamatus*, *L. scoparius*, *L. strigosus* var. *hirtellus*, *L. subpinnatus*, *Lupinus bicolor*, *L. densiflorus*, *L. nanus*, *Melilotus*, *Mimulus fremontii*, *Mirabilis laevis*, *Nemophila*, *Oenothera*, *Phacelia cicutaria*, *P. distans*, *P. hispida*, *P. imbricata*, *P. ramosissima*, *P. tanacetifolia*, *Pholisma racemosa*, *Platystemon californicus*, *Salix*, *Salvia columbariae*, *Sambucus*, *Trichostema lanatum*, *T. parishii*, *Viguiera laciniata*, *V. multiflora*.

*Anthidium compactum* Provancher, 1896. Nat. Canad. 23: 9. ♂. Preocc.

*Anthidium collectum* Hurd, 1896. Nat. Canad. 23: 124. N. name.

*Anthidium angelarum* Titus, 1906. Ent. Soc. Wash., Proc. 7: 164. ♀.

*Anthidium transversum* Swenk, 1914. Nebr. Univ., Studies 14: 19. ♀.

*Anthidium puncticaudum* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 360. ♂.

*Anthidium collectum bilderbacki* Cockerell, 1938. San Diego Soc. Nat. Hist., Trans. 9: 38. ♀.

*Anthidium catalinense* Cockerell, 1939. Calif. Acad. Sci., Proc. (4) 23: 433. ♂, ♀.

*Anthidium clementinum* Cockerell, 1939. South. Calif. Acad. Sci., Bul. 38: 138. ♀.

Taxonomy: Cockerell, 1904. South. Calif. Acad. Sci., Bul. 3: 57, 73. —Titus, 1906. Ent. Soc. Wash., Proc. 7: 163. —Cockerell, 1941. Sixth Pacific Sci. Cong., Proc., v. 4, p. 289 (*clementinum*). —Grigarrick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 16-19, figs. 19-21, 83, map 10 (synonymy).

Biology: Hicks, 1929. Canad. Ent. 61: 84 (nesting habits, copulation, nest construction, sleeping sites). —Hurd, 1958. Calif. Univ. Pubs. Ent. 14: 285, 292-293 (parasites). —Ferguson, 1962. Calif. Univ. Pubs. Ent. 27: 6-22 (parasites, nest).

**dammersi** Cockerell. Calif. (Colorado and Mojave deserts), Nev. Pollen: Unknown, but visits flowers of *Astragalus lentiginosus* var. *fremontii*, *Dalea fremontii*, *D. f.* var. *saundersii*, *Phacelia distans*.

*Anthidium dammersi* Cockerell, 1937. Amer. Mus. Novitates 948: 6. ♂, ♀.

**edwardsii** Cresson. Wash., Oreg., Calif., Idaho, Utah. Ecology: Nests in dead bamboo. Parasite: *Tricrania stansburyi* Hald. Pollen: Polylectic, visits a wide variety of flowers including *Achillea millefolium*, *Adenostegia pilosa*, *Astragalus*, *Bigelovia*, *Calochortus luteus*, *Cirsium*, *Clarkia speciosa*, *Cleome obtusifolia*, *Cordylanthus pilosa*, *C. tenuis*, *Cressa cretica*, *Eriogonum gracile*, *Eriophyllum*, *Frankenia grandiflora*, *Heliotropium curassavicum*, *Hemizonia*, *Lathyrus splendens*, *Lotus americanus*, *L. purshianus*, *L. scoparius*, *Marrubium vulgare*, *Medicago sativa*, *Melilotus*, *Monardella lanceolata*, *Navarretia heterodoxa*, *Penstemon heterophyllus*, *Phacelia distans*, *P. ramosissima*, *Solidago californica*, *Stephanomeria exigua*, *Trichostema lanceolatum*, *T. laxum*, *Trifolium obtusifolium*, *T. repens*, *T. variegatum*, *Verbena californica*, *V. lasiostachys*, *Wislizenia refracta*.

*Anthidium edwardsii* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 112. ♂.

*Anthidium 3-cuspidum* Provancher, 1896. Nat. Canad., 23: 10. ♂.

*Anthidium tricuspidum* Cockerell, 1904. South. Calif. Acad. Sci., Bul. 3: 57. Emend.

*Anthidium hesperium* Swenk, 1914. Nebr. Univ., Studies 14: 18. ♀.

*Anthidium depressum* Schwarz, 1927. Amer. Mus. Novitates 253: 4. ♂.

Taxonomy: Titus 1906. Ent. Soc. Wash. Proc. 7: 163. —Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 19-21, figs. 3, 49-51, 79, map. 12 (synonymy).

**emarginatum** (Say). B. C. to Calif., east to Kans., Nebr. and N. Mex. Ecology: Uses down from stems of *Cirsium undatum* for nest construction in Colo. Parasite: *Leucospis affinis* Say, *Monodontomerus montivagus* Ashm., *Nemognatha dubia* LeC., *N. lutea* LeC., *Physocephala texana* (Will.). Pollen: Apparently polylectic, visits flowers of *Arenaria*, *Astragalus bolanderi*, *Clarkia pulchella*, *Cryptantha intermedia*, *Dalea fremontii*, *Erigeron foliosus* var. *stenophyllus*, *Eriodictyon*, *Hackelia jessicae*, *Lotus argyraeus* multicaulis, *L. scoparius*, *Lupinus lyallii*, *L. superbus*, *Penstemon*, *Phacelia californica*, *P. superbus*, *P. frigida*, *P. heterophylla*, *P. ramosissima*, *Symphoricarpos*.

*Megachile emarginata* Say, 1824. In Keating, Narr. Long's 2nd Exped., v. 2, p. 352. ♀.

*Anthidium atrifrons* Cresson, 1868. Amer. Ent. Soc., Trans. 1: 387. ♀.

*Anthidium atriventris* Cresson, 1878. Amer. Ent. Soc., Trans. 7: Proc. iii. ♀.

*Anthidium sazorum* Cockerell, 1904. South. Calif. Acad. Sci., Bul. 3: 57. ♂.

*Anthidium collectum* var. *ultrapictum* Cockerell, 1904. South. Calif. Acad. Sci., Bul. 3: 73.

♂.

*Anthidium titusi* Cockerell, 1904. South. Calif. Acad. Sci., Bul. 3: 58. ♂.

*Anthidium bernardinum* var. *aridum* Cockerell, 1904. South. Calif. Acad. Sci., Bul. 3: 58.

♂.

*Anthidium astragali* Swenk, 1914. Nebr. Univ., Studies 14: 16. ♂, ♀.

*Anthidium fresnoense* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 347. ♀.

*Anthidium angulatum* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 357. ♂.

*Anthidium hamatum* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 358. ♂.

*Anthidium spinosum* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 359. ♂.

*Anthidium lucidum* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 361. ♂.

*Anthidium rhodophorum* Cockerell, 1925. Ann. and Mag. Nat. Hist. (9) 16: 623. ♀.

*Anthidium sculleni* Schwarz, 1930. N. Y. Ent. Soc., Jour. 38: 10. ♂.

Taxonomy: Cresson, 1864. Ent. Soc. Phila., Proc. 2: 374. ♀, ♂. —Cockerell, 1904. South. Calif. Acad. Sci., Bul. 3: 72. ♂ (*sazorum*). —Cockerell, 1904. South. Calif. Acad. Sci., Bul. 3: 73. ♂ (*titusi*). —Cockerell, 1904. South. Calif. Acad. Sci., Bul. 3: 76. —Schwarz, 1928. N. Y. Ent. Soc., Jour. 36: 372 (*bernardinum* var. *aridum*). —Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 21-22, figs. 34-36, 87, 95, map 13 (synonymy).

Biology: Hicks, 1926. Colo. Univ., Studies 15: 47 (collection of nest material).

**jocosum** Cresson. Mont., Colo., Calif.; Mexico (Baja California and Sonora). Pollen: Apparently polylectic, visits flowers of *Ceanothus*, *Chorizanthe staticoides*, *Cryptantha intermedia*, *Eriastrum plurifolium*, *Ericameria monactis*, *Eriodictyon*, *Eriogonum fasciculatum*, *E. f. polifolium*, *E. inflatum*, *Gutierrezia californica*, *Haplopappus cooperi*, *Hemizonia*, *Larrea tridentata*, *Lasthenia*, *Lotus scoparius*, *Marrubium vulgare*, *Oenothera*, *Penstemon*, *Phacelia ramosissima*, *Salvia carduacea*, *S. pachyphylla*, *Trifolium repens*.

*Anthidium jocosum* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 111. ♂.

*Anthidium xanthognathum* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 347. ♀.

*Anthidium fontis* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 348. ♂, ♀.

Taxonomy: Schwarz, 1927. Amer. Mus. Novitates 277: 5. ♀.

Biology: Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 35 (floral relationships).

**maculifrons** Smith. Ill., Tenn. and Va., south to Fla., west to Ariz.; Mexico. Pollen: Unknown, but visits flowers of *Afzelia*, *Asclepias*, *Bidens*, *Coreopsis*, *Cracca*, *Crotalaria*, *Galactia*, *Galax*, *Phaseolus*, *Psoralea*.

*Anthidium maculifrons* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 214. ♀.

*Anthidium cognatum* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 109. ♀, ♂.

Biology: Hungerford and Williams, 1912. Ent. News 23: 256.

**maculosum** Cresson. S. Dak., Colo., and Tex., west to Oreg. and Calif.; Mexico. Ecology: Nests in elderberry stems. Parasite: *Chrysus tripartita* Aaron, *Dioxys aurifuscus* (Titus), *Leucospis affinis* Say. Pollen: Apparently polylectic, visits flowers of *Antirrhinum*,



*Arctostaphylos*, *Aster*, *Astragalus douglasii* var. *parishii*, *Chrysopsis villosa*, *Cirsium vulgare*, *Cordylanthus nevadensis*, *Corethrogyne filaginifolia*, *Eriodictyon trichocalyx*, *Grindelia camporum*, *Haplopappus linearifolius*, *Helianthus*, *Hulsea callicarpa*, *Lotus argophyllus*, *L. corniculatus*, *L. davidsonii*, *L. humistratus*, *L. nevadensis*, *L. scoparius*, *L. strigosus* var. *hirtellus*, *Phacelia ramosissima*, *Senecio ionophyllus*, *Solidago californica*, *Stachys albens*, *S. bullata*, *S. pycnantha*, *Trichostema laxum*, *Verbena hastata*, *V. lasiostachys*.

*Anthidium maculatum* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 216. ♂. Preocc.

*Anthidium maculosum* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 110. ♀.

*Anthidium lupinellum* Cockerell, 1904. South. Calif. Acad. Sci., Bul. 3: 58. ♂.

*Anthidium americanum* Friese, 1911. Das Tierreich, v. 28, p. 395. N. name.

**Taxonomy:** Cockerell, 1900. Ann. and Mag. Nat. Hist. (7) 5: 412. ♂. —Cockerell, 1905. Amer. Ent. Soc., Trans. 31: 336. —Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 23-25, figs. 7, 9, 71, map 15.

**Biology:** Parker and Bohart, 1966. Pan-Pacific Ent. 42: 95 (nest, parasite). —Krombein, 1967. Trap-nesting wasps and bees, pp. 269-272, pl. 17, figs. 79, 80 (nest, supersedure, nest architecture, life history). —Horning, 1971. Ent. Soc. Wash., Proc. 73: 43 (nest, parasite).

**manicatum** Linnaeus. N. Y. (Ludlowville); Argentina, Brazil, Uruguay and Canary Is.; Europe.

**Ecology:** Nests readily in a wide variety of movable objects including trap-nests.

Adventive from Europe. Pollen: Polylectic, visits a wide variety of flowers for nectar and pollen in Europe and South America, but so far has only been taken at the flowers of *Caryopteris clandonensis* in N. Y.

*Apis manicata* Linnaeus, 1758. Syst. Nat., Ed. 10, p. 577.

*Apis uncata* Schrank 1802. Fauna Boica 2(2): 379.

**Taxonomy:** Moure and Urban, 1964. II Congr. Latino-Amer. Zool., An. 1: 96-102, figs. 1-5 (S. Amer. distr.). —Jaycox, 1967. Kans. Ent. Soc., Jour. 40: 124-126 (N. Amer. distr.).

**Biology:** Green, 1921. Ent. Soc. London, Proc., p. lxxii-lxxiii (territoriality). —Ward, 1928. Entomologist 61: 267-272 (territoriality). —Haas, 1960. Ztschr. Tierpsychol. 17: 402-416 (territoriality). —Pechuman, 1967. N. Y. Ent. Soc. 75: 68-73 (behavior).

**montivagum** Cresson. Colo.

*Anthidium montivagum* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 110. ♀, ♂.

**mormonum** Cresson. B. C., Idaho, Mont. and Nebr., south to Calif., Ariz. and N. Mex.; Mexico (Baja California). **Ecology:** Nests in deserted beetle burrows in old yucca floral scapes and oak stumps, uses down gathered from hairy leaves and stems of *Lepidospartum squamatum* for nest construction. Parasite: *Chelynia leucotricha* Ckll.? Pollen:

Apparently polylectic, visits flowers of *Astragalus*, *Ceanothus parviflorus*, *Chrysothamnus viscidiflorus*, *Cryptantha intermedia*, *Eriodictyon*, *Eriogonum fasciculatum*, *Grindelia*, *Lotus andersoni*, *L. argophyllus*, *L. davidsonii*, *L. nevadensis*, *L. oblongifolius*, *L. scoparius*, *L. strigosus* var. *hirtellus*, *Lupinus lobbi*, *Penstemon spectabilis*, *Phacelia ciliata*, *P. heterophylla*, *P. imbricata*, *P. pringeli*, *P. ramosissima*, *Rubus leucodermis*, *Stenotaphys linearifolius*, *Trifolium repens*.

*Anthidium mormonum* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 110. ♂.

*Anthidium blanditum* Cresson, 1879. Amer. Ent. Soc., Trans. 7: 206. ♀.

*Anthidium pondreum* Titus, 1902. Ent. News 13: 169. ♂.

*Anthidium pecosense* Cockerell, 1904. South. Calif. Acad. Sci., Bul. 3: 58. ♂.

*Anthidium bernardinum* var. *wilsoni* Cockerell, 1904. South. Calif. Acad. Sci., Bul. 3: 58. ♂.

*Anthidium bernardinum* var. *fragariellum* Cockerell, 1904. South. Calif. Acad. Sci., Bul. 3: 58. ♂.

*Anthidium blanditum praedentatum* Cockerell, 1907. Entomologist 40: 99. ♀.

*Anthidium pondreum* (!) Cockerell, 1911. U. S. Natl. Mus., Proc. 40: 248. ♂ (♀ misdet.).

*Anthidium wallisi* Cockerell, 1913. Canad. Ent. 45: 13. ♀.

*Anthidium nebrascense* Swenk, 1914. Nebr. Univ., Studies 14: 14. ♂, ♀.

*Anthidium praedentatum trianguliferum* Swenk, 1914. Nebr. Univ., Studies 14: 18. ♀.

*Anthidium flavicaudum* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 359. ♂.

*Anthidium wyomingense* Schwarz, 1927. Amer. Mus. Novitates 252: 20. ♀.

*Anthidium mormonum hicksi* Schwarz, 1934. Amer. Mus. Novitates 743: 4. ♀.

*Anthidium wallisi* var. *wallowana* Schwarz, 1940. Amer. Mus. Novitates 1058: 5. ♀.

Taxonomy: Cockerell, 1904. South. Calif. Acad. Sci., Bul. 3: 74. ♂ (*pecosense*). —Cockerell, 1904. South. Calif. Acad. Sci., Bul. 3: 75, 76. ♂, ♀ ? —Cockerell, 1911. U. S. Natl. Mus., Proc. 40: 248. ♂, ♀ (*pecosense*). —Schwarz, 1927. Amer. Mus. Novitates 252: 7 (*nebrascense*). —Schwarz, 1928. Canad. Ent. 60: 213 (*nebrascense*). —Schwarz, 1930. N. Y. Ent. Soc., Jour. 38: 9 (*nebrascense*). —Schwarz, 1940. Amer. Mus. Novitates 1058: 6 (*nebrascense*). —Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 25-27, figs 43-45, 80, 92, map 16 (synonymy).

Biology: Hicks, 1929. Ent. News 40: 105 (nesting habits).

**pallidiclypeum** Jaycox. Calif. Pollen: Unknown, but visits flowers of *Ceanothus*, *Collinsia bicolor*, *Delphinium parryi* var. *seditionsum*, *Lotus scoparius*, *Trifolium variegatum*.

*Anthidium pallidiclypeum* Jaycox, 1963. Pan-Pacific Ent. 39: 267, 5 figs. ♂, ♀.

**palliventre** Cresson. Utah, B. C., Oreg., Calif. Ecology: Excavates nest in sand. Pollen:

Unknown, but visits flowers of *Abronia maritima*, *Cakile edentula*, *Dudleya*, *Horkelia*, *Lathyrus littoralis*, *Lotus eriophorus*, *L. heermannii*, *Phacelia distans*, *P. ramosissima*.

*Anthidium palliventre* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 114. ♀.

*Anthidium pallidiventre* Dalla Torre, 1896. Cat. Hym., v. 10, p. 468. Emend.

*Anthidium californicum* Cresson, 1879. Amer. Ent. Soc., Trans. 7: 206. ♂.

*Anthidium palliventre vanduzeei* Cockerell 1937. Pan-Pacific Ent. 13: 150. ♀, ♂.

Taxonomy: Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 28-29, figs. 28-30, 85, map 18 (synonymy).

Biology: Hicks, 1928. Pan-Pacific Ent. 5: 51 (nest excavation).

**palmarum** Cockerell. West. Tex. to south. Calif. and Nev.; Mexico (Baja California). Ecology: Found in burrow of dead floral scape of *Yucca whipplei*. Pollen: Possibly oligolectic on *Phacelia* including *P. affinis*, *P. cicutaria*, *P. ciliata*, *P. crenulata*, *P. distans*, *P. hispida*, *P. ramosissima*, but visits other flowers including *Acamptopappus sphaerocephalus*, *Amsinckia*, *Aster tortifolius*, *Astragalus*, *Bebbia juncea*, *Encelia schottii*, *Encelia virginienensis actoni*, *Lotus argophyllus*, *Lotus scoparius*, *Oenothera*, *Senecio douglasii*, *Sphaeralcea*, *Stenotopsis linearifolius*.

*Anthidium palmarum* Cockerell, 1904. South. Calif. Acad. Sci., Bul. 3: 59. ♂.

*Anthidium palmarum micheneri* Schwarz, 1957. Kans. Ent. Soc., Jour. 30: 132. ♂, ♀.

Taxonomy: Snelling, 1962. Pan-Pacific Ent. 38: 226-227 (distribution and floral records, *palmarum micheneri*). —Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 29-30, figs. 64-66, 69, 74, map 19 (synonymy).

**paroselae** Cockerell. Tex. to south. Calif.; Mexico (Sonora). Ecology: Nests in hard sand; two flight periods occur, one in the spring and one in the autumn. Parasite: *Diozys productus subruber* (Ckll.)? Pollen: Polylectic, visits flowers of *Baileya multiradiata*, *Bebbia juncea*, *Croton californicus*, *Cryptantha barbigera*, *Dalea scoparia*, *Helianthus petiolaris* var. *canescens*, *Larrea tridentata*, *Malacothrix*, *Melilotus*, *Palafoxia linearis*, *Pulchea sericea*, *Prosopis*.

*Anthidium paroselae* Cockerell, 1898. Denison Univ. Sci. Labs., Bul. 11: 62. ♀.

*Anthidium parosetae*(!) Cockerell, 1906. Amer. Ent. Soc., Trans. 32: 302.

Taxonomy: Cockerell, 1898. N. Mex. Univ., Bul. 1: 62. ♀. —Cockerell, 1900. Ann. and Mag. Nat. Hist. (7) 5: 412. ♀, ♂. —Schwarz, 1929 (1928). N. Y. Ent. Soc., Jour. 36: 384. ♀, ♂. —Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 30, figs. 10-12, 73, 100, map. 20.

Biology: Newberry, 1900. Psyche 9: 94 (nest, parasite). —Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 35 (floral relationships).

**placitum** Cresson. Idaho and Wyo., south to Calif., Ariz. and N. Mex. Pollen: Apparently polylectic, although current data suggests a predilection for the flowers of *Cordylanthus* including *C. filifolius*, *C. nevadensis*, *C. rigidus brevivibratus*, but also visits flowers of *Chrysopsis villosa*, *Cryptantha intermedia*, *Eriodictyon trichocalyx*, *Eriogonum subscaposum*, *Gutierrezia californica*, *Monardella*, *Solidago confinis*.

*Anthidium placitum* Cresson, 1879. Amer. Ent. Soc., Trans. 7: 206. ♀.

*Anthidium bernardinum* Cockerell, 1904. South. Calif. Acad. Sci., Bul. 3: 58. ♂.

- Anthidium hesperium dentipygum* Swenk, 1914. Nebr. Univ., Studies 14: 19. ♀.  
*Anthidium permaculatum* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 349. ♀.  
*Anthidium bernardinum mesaverdense* Schwarz, 1927. Amer. Mus. Novitates 252: 15. ♂, ♀.  
*Anthidium niveumtarsum* Schwarz, 1927. Amer. Mus. Novitates 252: 18. ♂, ♀.

Taxonomy: Cockerell, 1904. South. Calif. Acad. Sci., Bul. 3: 74. ♂. — Schwarz, 1928. N. Y. Ent. Soc., Jour. 36: 378. ♀, ♂ (*permaculatum*). — Schwarz, 1937. N. Y. Ent. Soc., Jour. 45: 382. — Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 30-32, figs. 46-48, 78, 93, map 21 (synonymy).

- porterae** Cockerell. B. C., Mont., Wyo., Nebr., Colo., Ariz., N. Mex., Tex. Parasite: *Chrysis lauta* Cress. Pollen: Unknown, but visits flowers of *Asclepias*, *Erigeron*, *Penstemon coloradensis*, *P. occidentata*, *Petalostemon*, *Phacelia distans*, *Psilostrophe*.  
*Anthidium porterae* Cockerell, 1900. Ann. and Mag. Nat. Hist. (7) 5: 411. ♂, ♀.  
*Anthidium porterae* var. *amabile* Cockerell, 1904. Entomologist 37: 7. ♂.  
*Anthidium porterae personulatum* Cockerell, 1907. Canad. Ent. 39: 135. ♀, ♂.

Biology: Hicks, 1926. Colo. Univ., Studies 15: 247. — Custer and Hicks, 1927. Biol. Bul. 52: 258-267 (nesting habits). — Custer, 1928. Ent. News 39: 123 (nesting habits).

- psoraleae** Robertson. Colo. and N. Dak., east to Ill. and Mich.; although it has been questionably listed from B. C., Calif. and Ariz., there are no recent records west of Colo. Pollen: Unknown, but visits flowers of *Astragalus*, *Lobelia*, *Psoralea*, *Trifolium*, *Verbena*.  
*Anthidium psoraleae* Robertson, 1902. Canad. Ent. 34: 322. ♀, ♂.

Taxonomy: Schwarz, 1928. Canad. Ent. 60: 214. — Mitchell, 1962. N. C. Agr. Exp. Sta. Tech. Bul. 152: 11-13, fig. 3 (redescription).

- rodecki** Schwarz. Colo., Nev. (Washoe Co.).

*Anthidium rodecki* Schwarz, 1934. Amer. Mus. Novitates 743: 1. ♂, ♀.

- sonorense** Cockerell. Ariz., south. Nev. and south. Calif.; Mexico (Baja California and Sonora).

Pollen: Possibly an oligolege of *Larrea tridentata*, but a female has been collected at the flowers of *Prosopis*.

- Anthidium sonorense* Cockerell, 1923. Calif. Acad. Sci., Proc. (4) 12: 91. ♂.  
*Anthidium sonorense productum* Cockerell, 1923. Calif. Acad. Sci., Proc. (4) 12: 92. ♀.  
*Anthidium rohweri* Schwarz, 1927. Amer. Mus. Novitates 253: 7. ♂.

Taxonomy: Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 32, figs. 13-15, 72, 90, 99, map 22 (synonymy).

Biology: Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 35 (floral relationships).

- tenuiflorae** Cockerell. N. W. T., Alta., Sask., Mont., Wyo., S. Dak., south to Calif., Ariz., N.

Mex., and Nebr. Ecology: A nest was constructed between two rocks. Pollen: Unknown, but visits flowers of *Arenaria kingii*, *Aster foliaceus*, *Astragalus*, *Epilobium adenocaulum* var. *parishii*, *E. californicum*, *Gormania obtusata*, *Horkelia fusca*, *Lotus argophyllus*, *L. davidsonii*, *Lupinus confertus*, *L. lyallii* *lobbii*, *Penstemon secundiflorus*, *Phacelia frigida*, *P. heterophylla*, *Potentilla glandulosa*, *P. gracilis*, *Solidago confinis*, *Streptanthus tortuosus*, *Trifolium oliganthum*.

- Anthidium tenuiflorae* Cockerell, 1907. Canad. Ent. 39: 135. ♀, ♂.  
*Anthidium tenuiflorae yukonense* Cockerell, 1926. Ann. and Mag. Nat. Hist. (9) 18: 622. ♂, ♀.

Taxonomy: Schwarz, 1928. N. Y. Ent. Soc., Jour. 36: 379 (as *tenuiflorae yukonense*).

— Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 32-33, figs. 31-33, 88, 96, map 23 (synonymy).

Biology: Hicks, 1926. Colo. Univ., Studies 15: 217, 248 (nest).

- utahense** Swenk. B. C., Mont. and Utah, south to Calif., Nev. and Ariz. Ecology: Nests in ground in holes and crevices frequently using cavities made by other insects and animals as well as artificial nest cavities which offer vertical holes at ground level. Parasite: *Dioxyx productus* (Cress.)? Pollen: Polylectic, stores pollen of *Phacelia* and

*Melilotus*, but visits a wide variety of flowers, some of which may also serve as pollen sources including *Antirrhinum coulterianum*, *Artemisia*, *Aster*, *Astragalus bolanderi*, *Brodiaea laxa*, *Calycadenia multiglandulosa*, *Calyptridium umbellatum*, *Ceanothus*, *Chaenactis glabriuscula*, *Chamaebatia foliolosa*, *Cirsium vulgare*, *Clarkia amoena*, *C. cylindrica*, *C. speciosa speciosa*, *C. unguiculata*, *Croton californicus*, *Cryptantha intermedia*, *C. muricata*, *eriastrium plurifolium*, *Eriodictyon californicum*, *Eriogonum fasciculatum*, *E. f. polifolium*, *Grindelia*, *Hemizonia lobbii*, *Horkelia bolanderi*, *H. b. var. clevelandii*, *H. b. var. parryi*, *Lotus argophyllus*, *L. davidsonii*, *L. hamatus*, *L. humistratus*, *L. nevadensis*, *L. nuttallianus*, *L. purshianus*, *L. scoparius*, *L. strigosus* var. *hirtellus*, *Lupinus bicolor*, *L. nanus*, *Melilotus alba*, *Oenothera*, *Penstemon*, *Phacelia ramosissima*.

*Anthidium utahense* Swenk, 1914. Nebr. Univ., Studies 14: 23. ♂, ♀.

*Anthidium sagittipictum* Swenk, 1914. Nebr. Univ., Studies 14: 20. ♀.

*Anthidium divisum* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 350. ♀.

*Anthidium divisum nanulum* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 350. ♀.

*Anthidium divisum ornatifrons* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 350. ♀.

*Anthidium brachyurum* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 357. ♂.

Taxonomy: Schwarz, 1930. N. Y. Ent. Soc., Jour. 38: 10 (*divisum*). —Grigarick and Stange, 1968. Calif. Ins. Surv., Bul. 9: 33-35, figs. 31-33, 88, 96, map 23 (synonymy).

Biology: Jaycox, 1966. Pan-Pacific Ent. 42: 18-20 (nest, parasite). —Jaycox, 1967. Kans. Ent. Soc., Jour. 40: 569 (interspecific relationships).

### Genus CALLANTHIDIUM Cockerell

*Callanthidium* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 365.

Type-species: *Anthidium illustre* Cresson. Orig. desig.

**formosum** (Cresson). Mont., Colo., Nev., Oreg., Calif., Ariz. (Oak Creek Canyon). Pollen: Unknown, but visits flowers of *Astragalus*, *Castilleja*, *Clarkia cylindrica*, *Lotus argophyllus*, *Monardella linoides*, *Medicago sativa*, *Phacelia*.

*Anthidium formosum* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 112. ♂.

*Anthidium conspicuum* Cresson, 1879. Amer. Ent. Soc., Trans. 7: 207. ♀.

*Anthidium illustre* var. *consonum* Cresson, 1879. Amer. Ent. Soc., Trans. 7: 207. ♀.

*Dianthidium balli* Titus, 1902. Ent. News 13: 170. ♀.

*Callanthidium formosum pratense* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 366. ♂.

Taxonomy: Cockerell, 1909. Ent. News 20: 262. —Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 36, figs. 101-105, map 25 (geogr. and floral records).

**illustre** (Cresson). Utah, Oreg., Calif., Nev., Ariz., N. Mex.; Mexico (Baja California). Ecology:

Nests in dead, floral scape of *Yucca whipplei* and in stump of oak. Parasite: *Dioxys aurifuscus* (Titus)?, *Nemognatha scutellaris* LeC., *Sphaerophthalma unicolor* (Cress.).

Pollen: Polylectic, stores pollen of *Lotus scoparius* in southern Calif., visits a wide variety of flowers including *Artemisia californica*, *Astragalus douglasii*, *Calochortus*, *Cirsium*, *Castilleja plagiotoma*, *Clarkia*, *Collinsia*, *Cordylanthus nevinii*, *Cryptantha intermedia*, *Eriodictyon crassifolium*, *E. trichocalyx*, *E. t. var. lanatum*, *Helianthus*, *Lathyrus odoratus*, *Lotus argophyllus*, *L. oblongifolius*, *L. scoparius*, *Lupinus albifrons*, *Malacothamnus arcuatus*, *Medicago sativa*, *Penstemon*, *Phacelia distans*, *P. grandiflora*, *P. heterophylla*, *P. imbricata*, *P. ramosissima*, *Turricula parryi*.

*Anthidium illustre* Cresson, 1879. Amer. Ent. Soc., Trans. 7: 206. ♀.

*Anthidium serranum* Cockerell, 1904. South. Calif. Acad. Sci., Bul. 3: 24. ♂.

Taxonomy: Cockerell, 1909. Ent. News 20: 262. ♂. —Schwarz, 1940. Amer. Mus. Novitates 1058: 3. —Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 36-38, figs. 4, 106-110, map 26 (geogr. and floral records).

Biology: Johnson, 1904. Ent. News 15: 284 (nest). —Hicks, 1929. Canad. Ent. 61: 1-8 (nest, parasite). —Parker and Bohart, 1966. Pan-Pacific Ent. 42: 96 (nest).

### Genus DIANTHIDIUM Cockerell

*Anthidium* subg. *Dianthidium* Cockerell, 1900. Ann. and Mag. Nat. Hist. (7) 5: 412.

Type-species: *Dianthidium sayi* Cockerell. Orig. desig. (= *Anthidium curvatum* Cockerell).

Taxonomy: Schwarz, 1926. Amer. Mus. Novitates 226: 1-15 (N. Amer. spp.). —Timberlake, 1943. N. Y. Ent. Soc., Jour. 51: 71-109 (racial differentiation of Nearctic spp.).

—Timberlake, 1948 N. Y. Ent. Soc., Jour. 56: 149-153 (additions and corrections).

—Timberlake, 1949. Pan-Pacific Ent. 25: 129-132 (Baja Calif. spp.). —Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 15-18, figs. 1, 5, table 1 (eastern U. S. spp.). —Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 38-58, figs. 5, 138-203, 221-224, maps 27-39 (Calif. spp.).

Biology: Hurd and Linsley, 1950. N. Y. Ent. Soc., Jour. 58: 247-250 (parasites and inquilines).

—Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 39 (summary of literature).

—Clement, 1976. Wasmann Jour. Biol. 34: 9-10 (summary of literature).

**concinnum** (Cresson). Kans., Colo., Tex., Ariz. Ecology: Nests have been reported from underside of stone and in dead branch of Chinese elm.

*Anthidium concinnum* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 270. ♀, ♂.

Biology: Hungerford and Williams, 1912. Ent. News 23: 256 (nest). —Schwarz, 1928. N. Y.

Ent. Soc., Jour. 36: 408-409 (nest). —Fischer, 1951. Kans. Ent. Soc. Jour. 24: 46, figs. 1, 2 (nest).

**cressonii** (Dalla Torre). Utah, Colo., Nev., Ariz., N. Mex.

*Anthidium venustum* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 113. ♀. Preocc.

*Anthidium cressonii* Dalla Torre, 1896. Cat. Hym., v. 10, p. 458. N. name.

**curvatum curvatum** (Smith). N. C. to Fla., west to Mo. and Ark. Pollen: Unknown, but visits flowers of *Aster*, *Chrysopsis*, *Helenium*, *Koellia*, *Psoralea*.

*Anthidium curvatum* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 215. ♀.

**curvatum sayi** Cockerell. Alta., Idaho, Utah, Colo. and Kans., south to east. Calif., Ariz. and Tex. Ecology: Nests in aggregations in the soil, uses resin from stems and leaves of *Helianthus petiolaris* for nest construction. Parasite: *Dasynutilla asopus bexar* (Blake), *Eusappha rubripes* Cress., *Monodontomerus montivagus* Ashm., *Rhydinofoenus pattersonae* Melander and Brues, *Sphaerophthalma uro* (Blake), *Villa* (*Anthrax*) sp. *Megachile interrupta* Say, 1824. In Keating, Narr. Long's 2nd Exped., v. 2, p. 350. ♂, ♀. Preocc.

*Dianthidium Sayi* Cockerell, 1907. Canad. Ent. 39: 136. N. name.

Taxonomy: Michener, 1953. Kans. Univ. Sci., Bul. 35: 1045, figs. 130-133 (larva). —Grigarick

and Stange, 1968. Calif. Ins. Surv., Bul. 9: 41-42, figs. 171-173, 178, 197, map 27 (tax. characters, geogr. records).

Biology: Hungerford and Williams, 1912. Ent. News 23: 256 (nest, as *curvatum*). —Hicks, 1926. Amer. Nat. 9: 199 (nest). —Hicks, 1926. Colo. Univ., Studies 15: 249 (nest, parasite).

—Custer and Hicks, 1927. Biol. Bul. 52: 268 (nest). —Custer, 1928. Ent. News 39: 123

(nest). —Mickel, 1928. U. S. Natl. Mus., Bul. 143: 61 (parasite). —Fischer, 1951. Kans. Ent. Soc., Jour. 24: 47-49 (nest).

**curvatum xerophilum** Cockerell. N. Mex., Ariz. (Apache Pass).

*Dianthidium Sayi xerophilum* Cockerell, 1907. Canad. Ent. 39: 136. ♀.

**desertorum** Timberlake. South. Calif. (Colorado Desert). Pollen: Unknown, but visits flowers of *Hyptis emoryi*.

*Dianthidium desertorum* Timberlake, 1943. N. Y. Ent. Soc., Jour. 51: 84. ♂, ♀.

Taxonomy: Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 42, figs. 168-170, 184, 196, map 28 (tax. characters, geogr. and floral records).

**discors** Timberlake. West Tex., Ariz.

*Dianthidium discors* Timberlake, 1948. N. Y. Ent. Soc., Jour. 56: 149. ♀.

**dubium dilectum** Timberlake. Calif. (Central Coast and Peninsular ranges). Ecology: Nests made of gravel and resin have been found attached to a leaf and on exposed clay shales. Parasite: *Amobia floridensis* (Twn.), *Chrysis coerulans* Fabr., *Sapyga nevadica* Cress., *Toxophora pellucida* Coq. Pollen: Apparently polylectic, visits flowers of *Achillea*

*millefolium*, *Calochortus weedii*, *Chenopodium*, *Cirsium vulgare*, *Convolvulus*, *Cordylanthus pilosus*, *Corethrogyne*, *Dicentra*, *Encelia californica*, *Erigeron*, *Eriodictyon trichocalyx*, *E. t. var. lanatum*, *E. parryi*, *Eriogonum elegans*, *E. fasciculatum*, *Helianthus gracilentus*, *Hesperochiron californicum*, *Lepidium virginicum*, *Lotus americanus*, *L. humistratus*, *L. scoparius*, *Monardella villosa*, *Penstemon*, *Phacelia ramosissima*, *Stachys pycnantha*, *Stephanomeria cichoriacea*, *Trichostema parishii*, *Turricula parryi*, *Verbena lasiostachys*, *Viguiera multiflora*, *Dianthidium dubium dilectum* Timberlake, 1948. N. Y. Ent. Soc., Jour. 56: 152. ♀, ♂.

Taxonomy: Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 42-43, map 2 (tax. characters, geogr. and floral records).

Biology: Hurd and Linsley, 1950. N. Y. Ent. Soc., Jour. 58: 247, 248 (nest, parasite).

**dubium dubium** Schwarz. South. Oreg. and north. Calif. (Coast Range, north of San Francisco; Cascade Range; and west. slope of Sierra Nevada Mts.). Ecology: Nests are made of resin and gravel attached to vegetation or rocks. Pollen: Apparently polylectic, visits flowers of *Bigelovia*, *Chamaebatia foliolosa*, *Clarkia biloba*, *C. cylindrica*, *C. dudleyana*, *C. unguiculata*, *Collinsia tinctoria*, *Eriodictyon*, *Eriogonum latifolium nudum*, *Gayophytum nuttallii*, *Lessingia leptoclada*, *Lotus americanus*, *L. nevadensis*, *L. purshianus*, *Monardella lanceolata*, *Marrubium vulgare*, *Penstemon spectabilis*, *Stachys ajugoides*, *Stephanomeria virgata*, *Trichostema lanceolatum*, *T. laxum*, *Trifolium*, *Vicia*.

*Dianthidium dubium* Schwarz, 1928. N. Y. Ent. Soc., Jour. 36: 405. ♂, ♀.

Taxonomy: Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 42, 43-44, figs. 5, 138-140, 185, 195, map 29 (tax. characters, geogr. and floral records).

**dubium mCCRACKENAE** Timberlake. Calif. (east slope, Sierra Nevada Mts.). Pollen: Unknown, but visits flowers of *Eriastrum densifolium*.

*Dianthidium consimile mCCRACKENAE* Timberlake, 1943. N. Y. Ent. Soc., Jour. 51: 104. ♀, ♂.

*Dianthidium plenum convictorum* Timberlake, 1943. N. Y. Ent. Soc., Jour. 51: 108. ♀.

Taxonomy: Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 44-45, map 29 (tax. characters, geogr. and floral records).

**floridiense** Schwarz. Fla. Ecology: Nests in borings. Pollen: Unknown but visits flowers of *Bidens*, *Sabal*.

*Dianthidium floridiense* Schwarz, 1926. Amer. Mus. Novitates 226: 5. ♂, ♀.

*Dianthidium floridense*(?) Michener, 1951. In Muesebeck, Krombein and Townes, U. S. Dept. Agr., Agr. Monog. 2: 1143.

Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 16-17 (redescription).

Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 272-273 (nest architecture, life history).

**heterulkei fraternum** Timberlake. Tex., N. Mex., Ariz., Nev. Parasite: *Anthrax irroratus* Say.

*Dianthidium fraternum fraternum* Timberlake, 1943. N. Y. Ent. Soc., Jour. 51: 92. ♂, ♀.

Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 273-274 (nest architecture, life history, parasite).

**heterulkei heterulkei** Schwarz. Calif. (Sierra Nevada Mts.), Oreg., Nev., Utah, Wyo. Ecology: Constructs nests in natural depressions within volcanic outcroppings and possibly uses lodgepole pine as source of resin. Parasite: *Monodontomerus clementi* Grissell. Pollen: Polylectic, is known to collect pollen from flowers of *Eriophyllum integrifolium*, *Trifolium longipes*, but also visits flowers of *Aster*, *Chaenactis glabriuscula lanosa*, *Chrysothamnus*, *Haplopappus suffruticosa*, *Solidago*.

*Dianthidium heterulkei* Schwarz, 1940. Amer. Mus. Novitates 1058: 6. ♂, ♀.

*Dianthidium heterulkei* var. *cornucopianae* Schwarz, 1940. Amer. Mus. Novitates 1058: 8. ♂.

*Dianthidium fraternum hirtulum* Timberlake, 1943. N. Y. Ent. Soc., Jour. 51: 94. ♂, ♀.

Taxonomy: Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 45-46, figs. 159-161, 181, 194, map 30 (geogr. and floral records). — Clement, 1976. Wasmann Jour. Biol. 34: 16-18, fig. 2 (larva).

- Biology: Clement, 1976. Wasmann Jour. Biol. 34: 9-22, 2 figs. (nest site, nest architecture, life history, mating, floral relationships, parasite).
- implicatum** Timberlake. Tex. to south. Calif. and Nev.; Mexico (Chihuahua). Ecology: A pebble and resin nest attached to a twig of *Dalea*. Pollen: Unknown, but visits flowers of *Cevallia*, *Gutierrezia microcephala*.  
*Dianthidium implicatum* Timberlake, 1948. N. Y. Ent. Soc., Jour. 56: 150. ♀.
- Taxonomy: Grigarick and Stange, 1964. Pan-Pacific Ent. 40: 152. (male). — Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 46, figs. 150-152, 174, 190, map 31 (geogr. and floral record).
- marshi** Grigarick and Stange. Calif., Ariz. (Santa Catalina Mts.). Pollen: Unknown, but visits flowers of *Bebbia*, *Eriastrum densifolium*.  
*Dianthidium marshi* Grigarick and Stange, 1964. Pan-Pacific Ent. 40: 149, figs. 1, 2, 3, 10, 11. ♂, ♀.
- Taxonomy: Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 46-47, figs. 147-149, 186-187, 201, map 32 (geogr. and floral records).
- parkeri** Grigarick and Stange. Ariz., Tex.; Mexico (Sonora, Sinaloa, Durango). Pollen: Unknown, but visits flowers of *Verbesina encelioides*.  
*Dianthidium parkeri* Grigarick and Stange, 1964. Pan-Pacific Ent. 40: 150, figs. 4, 5, 6, 12. ♂, ♀.
- parvum** (Cresson). N. Mex., west to Colo., Utah, Nev. and Calif.; Mexico. Pollen: Unknown, but visits flowers of *Chrysothamnus*, *Grindelia serrulata*, *Hyptis emoryi*, *Palafoxia linearis*, *Senecio douglasii*.  
*Anthidium parvum* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 114. ♀, ♂.  
*Dianthidium profugum* Cockerell, 1923. Calif. Acad. Sci., Proc. (4) 12: 90. ♀.  
*Dianthidium parvum heteropoda* Schwarz, 1934. Amer. Mus. Novitates 743: 4. ♀.  
*Dianthidium parvum basingeri* Timberlake, 1943. N. Y. Ent. Soc., Jour. 51: 97. ♂.
- Taxonomy: Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 47-48, figs. 153-155, 183, 188, 190, map 33 (synonymy, geogr. and floral records).
- parvum schwarzi** Timberlake. South. Calif. Pollen: Unknown, but visits flowers of *Asclepias erosa*, *Chrysothamnus nauseosus mohavensis*, *Corethrogyne bernardina*, *Croton californicus*, *Encelia californica*, *Erigeron foliosus* var. *stenophyllus*, *Eriogonum fasciculatum polifolium*, *E. gracile*, *Grindelia*, *Gutierrezia californica*, *G. microcephala*, *G. sarothrae*, *Heterotheca grandiflora*, *Lepidospartum squamatum*, *Lotus scoparius*, *Senecio douglasii*, *Stephanomeria exigua*.  
*Dianthidium parvum schwarzi* Timberlake, 1943. N. Y. Ent. Soc., Jour. 51: 96. ♀, ♂.
- Taxonomy: Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 48, map 33 (geogr. and floral records).
- platyurum mohavense** Timberlake. Calif. Pollen: Unknown, but visits flowers of *Erigeron*, *Eriogonum fasciculatum*.  
*Dianthidium platyurum mohavense* Timberlake, 1943. N. Y. Ent. Soc., Jour. 51: 87. ♀.
- Taxonomy: Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 49, map 34 (geogr. and floral records).
- platyurum platyurum** Cockerell. Tex., Ariz., west. Nev., Calif.; Mexico (Baja California). Pollen: Unknown, but visits flowers of *Bebbia juncea*, *Encelia californica*, *Erigeron foliosus* var. *stenophyllus*, *Eriastrum densifolium*, *E. plurifolium*, *E. virgatum*, *Eriogonum*, *Gutierrezia californica*, *G. sarothrae*, *Heterotheca grandiflora*, *Lotus scoparius*, *Malacothrix*, *Phacelia ramosissima*, *Senecio douglasii*, *Stephanomeria exigua*, *S. virgata*.  
*Dianthidium platyurum* Cockerell, 1923. Calif. Acad. Sci., Proc. (4) 12: 90. ♂, ♀.  
*Dianthidium parvum baculifrons* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 365. ♀.  
*Dianthidium ulkei riparii* Schwarz, 1928. N. Y. Ent. Soc., Jour. 36: 400. ♂, ♀.
- Taxonomy: Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 49-50, figs. 165-167, 180, 200, map 34 (geogr. and floral records).

Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 274-275 (nest architecture, life history).

**plenum** Timberlake, Oreg., Calif. and west. Nev. Ecology: A resin and gravel nest attached in crotch of apple tree. Pollen: Unknown, but visits flowers of *Chaenactis glabriuscula lanosa*, *Monardella lanceolata*, *Phacelia*.

*Dianthidium plenum plenum* Timberlake, 1943. N. Y. Ent. Soc., Jour. 51: 106. ♂, ♀.

*Dianthidium plenum williamsi* Timberlake, 1943. N. Y. Ent. Soc., Jour. 51: 107. ♂.

Taxonomy: Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 50-51, figs. 144-146, 175, 193, 225, map 35 (synonymy, geogr. and floral records).

**pudicum consimile** (Ashmead). Ariz., Calif.; Mexico (Baja California). Ecology: Constructs nest of resin and large grains of sand or gravel, either in the crotches of terminal branches of shrubs or in depressions or angles of stones or boulders lying on the ground. Parasite: *Eusapyga verticalis* Cress., *Leucospis affinis* Say, *Microdontomerus anthidii* (Ashm.), *Monodontomerus montivagus* Ashm., *Sapyga minor* Roberts. Pollen: Unknown, but visits flowers of *Cirsium vulgare*, *Corethrogyne*, *Cryptantha intermedia*, *Encelia californica*, *Eriastrum densifolium*, *E. plurifolium*, *Eriodictyon crassifolium*, *E. trichocalyx* var. *lanatum*, *Eriogonum fasciculatum*, *E. inflatum*, *E. latifolium nudum*, *Grindelia camporum*, *G. robusta*, *G. stricta procumbens*, *Gutierrezia californica*, *G. microcephala*, *G. sarothrae*, *Haplopappus*, *Krameria grayi*, *Lonicera hispidula* var. *vacillans*, *Lotus glaber*, *L. scoparius*, *Melilotus indica*, *Monardella villosa*, *Phacelia distans*, *P. ramosissima*, *Salvia*, *Stachys pycnantha*, *Stephanomeria cichoriacea*, *S. exigua*, *Trichostema lanceolatum*. Predator: *Trichodes ornatus ornatus* Say, *T. o. tenellus* LeC.

*Anthidium consimile* Ashmead, 1896. Ent. News 7: 25 "♀" = ♂.

*Dianthidium provancheri* Titus, 1906. Ent. Soc. Wash., Proc. 7: 164. ♂.

*Dianthidium plenum australe* Timberlake, 1943. N. Y. Ent. Soc., Jour. 51: 108. ♀.

*Dianthidium macsweeni* Timberlake, 1943. N. Y. Ent. Soc., Jour. 51: 109. ♀.

*Dianthidium pudicum peninsulare* Timberlake, 1949. Pan-Pacific Ent. 25: 130. ♂.

Taxonomy: Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 51-52, map 36 (synonymy, geogr. and floral records).

Biology: Davidson, 1896. Ent. News 7: 22 (nest, parasites). —Hicks, 1934. Colo. Univ. Studies 21: 265 (nest, parasites). —Linsley and MacSwain, 1942. Ent. Soc. Amer., Ann. 36: 589 (parasite). —Hurd and Linsley, 1950. N. Y. Ent. Soc. 58: 248, 249 (parasites). —Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 52 (summary of literature).

**pudicum pudicum** (Cresson). B. C. and Alta., south to Ariz. and Calif. Ecology: Constructs nest of resin and gravel either in crotches of small trees or shrubs or on underside of rocks. Parasite: *Eusapyga proxima* (Cress.), *E. rubripes* (Cress.), *Monodontomerus montivagus* Ashm., *Sapyga* sp., *Zonitis* sp. Pollen: Unknown, but visits flowers of *Aster*, *Chaenactis glabriuscula lanosa*, *Chrysothamnus*, *Cirsium vulgare*, *Cleome lutea*, *Eriastrum densifolium*, *Gormania obtusata*, *Medicago sativa*, *Oenothera clavaeformis cruciformis*, *Streptanthus tortuosus*, *Symphoricarpos*.

*Anthidium pudicum* Cresson, 1879. Amer. Ent. Soc., Trans. 7: 208. ♂.

*Anthidium pudens* Cresson, 1879. Amer. Ent. Soc., Trans. 7: 208. ♀.

*Dianthidium pudicum decorum* Timberlake, 1943. N. Y. Ent. Soc., Jour. 51: 100. ♀, ♂.

*Dianthidium pudicum ingoense* Timberlake, 1943. N. Y. Ent. Soc., Jour. 51: 101. ♀, ♂.

Taxonomy: Grigarick and Stange, 1968. Calif. Ins. Surv., Bul. 9: 53-54, figs. 141-143, 176, 191, map 36 (synonymy, geogr. and floral records).

Biology: Hicks, 1927. Psyche 34: 193. (nest, parasites). —Hicks, 1931. Canad. Ent. 63: 173 (nest). —Hicks, 1934. Colo. Univ. Studies 21: 268 (nest, parasites). —Roberts, 1933. Kans. Ent. Soc., Jour. 61: 91 (parasite). —Hurd and Linsley, 1950. N. Y. Ent. Soc., Jour. 58: 248 (parasites, as *pudicum decorum*). —Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 53 (summary of literature). —Clement and Rust, 1974. Pan-Pacific Ent. 50: 87-89, 1 fig. (nest).

**simile** (Cresson). Minn. to Ont. and Maine, south to Ga. Ecology: Reared from partly rotted log. Pollen: Unknown, but visits flowers of *Aster*, *Clethra*.

*Anthidium simile* Cresson, 1864. Ent. Soc. Phila., Proc. 2: 378. ♀, ♂.



Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 17-18, fig. 5 (redescript.).

Biology: Fischer, 1951. Kans. Ent. Soc., Jour. 24: 46-47 (nest).

**singulare** (Cresson). Calif., Nev. Ecology: Constructs nest of resin and pebbles on side or face of rocks. Pollen: Unknown, but visits flowers of *Chaenactis glabriuscula lanosa*, *Chrysanthemum*, *Chrysothamnus*, *Cirsium californicum*, *Erysimum asperum*, *Lupinus parishii*, *Perideridia*, *Solidago californica*, *Viguiera multiradiata*.

*Anthidium singulare* Cresson, 1879. Amer. Ent. Soc., Trans. 7: 207. ♀.

*Dianthidium singulare* var. *perluteum* Cockerell and Cockerell, 1904. In Cockerell, South. Calif. Acad. Sci., Bul. 3: 23. ♀.

*Dianthidium singulare melanognathum* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 363. ♀.

Taxonomy: Cockerell, 1925. Calif. Acad. Sci. Proc. (4) 14: 363. ♂, ♀ (*singulare perluteum*).

—Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 54, figs. 135-137, 177, 202-203, map 37 (synonymy, geogr. and floral records).

Biology: Michener, 1935. Pan-Pacific Ent. 11: 23-24 (nest). —Timberlake, 1943. N. Y. Ent. Soc., Jour. 51: 75 (nest). —Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 54

(summary of literature).

**subparvum** Swenk. B. C., Idaho and Mont., south to Calif., Nev., Utah and Wyo. Pollen:

Possibly oligolege of Compositae, visits flowers of *Aster alpigenus*, *A. andersonii*, *A. canescens*, *A. foliaceus*, *Chaenactis glabriuscula*, *Chaetopappa aurea*, *Chenopodium*, *Chrysothamnus viscidiflorus*, *Clematis pauciflora*, *Corethrogyne bernardina*, *Erigeron divergens*, *Erigeron foliosus*, *E. f. var. stenophyllus*, *Eriogonum fasciculatum*, *Grindelia*, *Gutierrezia californica*, *G. sarothrae*, *Haplopappus suffruticosus*, *Linum*, *Lotus strigosus* var. *hirtellus*, *Machaeranthera tephrodes*, *Phacelia*, *Ranunculus*, *Senecio douglasii*, *Solidago*.

*Dianthidium subparvum* Swenk, 1914. Nebr. Univ., Studies 14: 30. ♀, ♂.

*Dianthidium semiparvum* Schwarz, 1926. Amer. Mus. Novitates 226: 12. ♂.

*Dianthidium semiparvum gallatinae* Schwarz, 1927. Amer. Mus. Novitates 277: 6. ♂, ♀.

*Dianthidium parvum* var. *swenki* Schwarz, 1928. N. Y. Ent. Soc., Jour. 36: 402. ♂ (♀ misdet.).

Taxonomy: Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 54-56, figs. 156-158, 182, 189, 192, map 38 (synonymy, geogr. and floral records).

**subrufulum** Timberlake. Mo., Ark., Tex.

*Dianthidium subrufulum* Timberlake, 1943. N. Y. Ent. Soc., Jour. 51: 78. ♂, ♀.

**ulkei cooleyi** Schwarz. Mont.

*Dianthidium ulkei cooleyi* Schwarz, 1927. Amer. Mus. Novitates 277: 7. ♀.

Taxonomy: Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 58 (taxonomic status).

**ulkei perterritum** Cockerell. Nebr., N. Mex., Ariz. Ecology: Nests in borings, constructs nest using resin and pebbles. Parasite: *Nemognatha nigripennis* LeC.

*Dianthidium ulkei perterritum* Cockerell, 1913. Ann. and Mag. Nat. Hist. (8) 11: 191. ♀.

Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 275-276, pl. 17, fig. 81 (nest architecture, supersedure, life history, parasite).

**ulkei ulkei** (Cresson). B. C., Idaho, Mont. and S. Dak. south to Calif., Nev., Utah, N. Mex. and Nebr. Ecology: Nests in abandoned nests of other aculeates, cavities or short tunnels in the ground, and trap nests. Parasite: *Eusapyga verticalis* (Cress.). Pollen: Possibly an oligolege of Compositae, but visits a wide variety of flowers including *Achillea*

*millefolium*, *Aster ascendens*, *A. canescens*, *Calycadenia multiglandulosa*, *Centaurea*, *Chaetopappa aurea*, *Chrysopsis fastigiata*, *C. villosa*, *Chrysothamnus nauseosus*, *C. viscidiflorus*, *C. v. typicus*, *Cleomella serrulata*, *Cordylanthus filifolius*, *Encelia californica*, *Eriastrum densifolium*, *Erigeron divergens*, *E. foliosus* var. *stenophyllus*, *Eriodictyon*, *Eriogonum fasciculatum*, *E. subscaposum*, *E. vimineum*, *Gilia capitata*, *Grindelia camporum*, *G. serrulata*, *Haplopappus arborescens*, *H. bloomeri*, *Helenium bigelovii*, *Helianthus petiolaris*, *Heterotheca grandiflora*, *Lessingia leptoclada*, *Lotus davidsonii*, *L. scoparius*, *Machaeranthera tephrodes*, *Medicago sativa*, *Melilotus alba*,

*Monardella laceolata*, *Ranunculus*, *Senecio douglasii*, *S. ionophyllus*, *Solidago californica*, *Stephanomeria californica*, *S. cichoracea*, *S. virgata*, *Vicia cracca*, *Viguiera multiflora*.

*Anthidium ulkei* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 115. ♀.

*Anthidium davidsoni* Cockerell, 1904. South. Calif. Acad. Sci., Bul. 3: 5. ♂.

*Dianthidium ulkei reductum* Timberlake, 1943. N. Y. Ent. Soc., Jour. 51: 82. ♀, ♂.

Taxonomy: Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 56-58, figs. 162-164, 179, 198, map 39 (synonymy, geogr. and floral records).

Biology: Hicks, 1926. Colo. Univ., Studies 15: 250 (nest). —Hicks, 1933. Ent. News 44: 75 (nest). —Parker and Bohart, 1966. Pan-Pacific Ent. 42: 96. —Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 58 (summary of literature).

### Genus ANTHIDIELLUM Cockerell

*Anthidium* subg. *Anthidiellum* Cockerell, 1904. South. Calif. Acad. Sci., Bul. 3: 3.

Type-species: *Anthidium strigatum* Panzer. Orig. desig.

*Anthidium* subg. *Ceri-anthidium* Friese, 1923. Die Europ. Bienen, p. 304.

Type-species: *Anthidium strigatum* Panzer. Desig. by Cockerell, 1925.

*Cerianthidium* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 361. Emend.

Revision: Schwarz, 1926. Amer. Mus. Novitates 226: 15-19 (N. Amer. spp.)

Taxonomy: Schwarz, 1928. N. Y. Ent. Soc., Jour. 36: 369-418, 23 figs. (status of spp. and sub spp.). —Schwarz, 1957. Kans. Ent. Soc., Jour. 30: 137 (key to spp. of *notatum* complex). —Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 18-23, figs. 1, 6-7, table 1 (eastern U. S. spp.). —Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 58-62, figs. 204-211, maps 40-41 (Calif. spp.).

**ehrhorni** (Cockerell). Ariz., Nev., Calif.; Mexico (Baja California). Ecology: Constructs a single celled nest of resin attached to twigs or flat pieces of wood. Pollen: Apparently polylectic, visits flowers of *Asclepias*, *Baileya*, *Chaenactis fremontii*, *Dalea schottii*, *Encelia*, *Eriogonum inflatum*, *Geraea canescens*, *Larrea tridentata*, *Lotus scoparius*, *Pluchea distans*, *P. ramosissima*, *Pluchea sericea*, *Prosopis*, *Stephanomeria virgata*, *Trixis californica*.

*Anthidium* (*Dianthidium*) *ehrhorni* Cockerell, 1900. Ann. and Mag. Nat. Hist. (7) 5: 414. ♂.

Taxonomy: Schwarz, 1929 (1928). N. Y. Ent. Soc., Jour. 36: 392. ♀. —Michener, 1953. Kans. Univ. Sci. Bul. 35: 1045, figs. 119, 123, 124, 127 (larva). —Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 59-60, figs. 208-211, map 40 (geogr. and floral records).

Biology: Schwarz, 1928. N. Y. Ent. Soc., Jour. 36: 397 (nest). —Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 60, fig. 227 (nest). —Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 35-36 (floral relationships).

**notatum boreale** (Robertson). Ill., Nebr. Pollen: Unknown, but visits flowers of *Verbena stricta*.

*Dianthidium boreale* Robertson, 1902. Canad. Ent. 34: 323. ♂.

Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 20-21 (redescription).

**notatum gilense** (Cockerell). Colo., Ariz., N. Mex., Tex.

*Anthidium gilense* Cockerell, 1897. Canad. Ent. 29: 222. ♀.

Taxonomy: Cockerell, 1900. Ann. and Mag. Nat. Hist. (7) 5: 413. ♂.

**notatum notatum** (Latreille). Mass. to Ill., south to Fla. and Miss. Pollen: Apparently polylectic, visits flowers of *Azelia*, *Baptisia*, *Chrysopsis*, *Desmodium*, *Erigeron*, *Eupatorium*, *Galactia*, *Helianthus*, *Melilotus*, *Monarda*, *Phaseolus*, *Psoralea*, *Solidago*, *Trifolium*.

*Anthidium notatum* Latreille, 1809. Mus. Nat. Hist., Ann. 13: 48, 231. ♂.

Taxonomy: Cresson, 1864. Ent. Soc. Phila., Proc. 2: 376. ♀, ♂. —Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 19-20, fig. 6 (redescription, floral records).

**notatum robertsoni** (Cockerell). B. C., Idaho, Colo., Utah, Oreg., Calif., Nev., Ariz.; Mexico (Baja California). Pollen: Polylectic, visits a wide variety of flowers including *Agastache*, *Amorpha californica*, *Aster adscendeus*, *Astragalus*, *Chrysothamnus*, *Clarkia biloba*, *C. elegans*, *C. rhomboidea*, *Cordylanthus pilosus*, *C. rigidus*, *Clematis pauciflora*, *Cryptantha intermedia*, *Dalea*, *Eriodictyon*, *Eriogonum fasciculatum*, *E. latifolium nudum*, *Grindelia*, *Gutierrezia californica*, *Heliotropium curassavicum*, *Hemizonia fasciculata*, *Lippia*, *Lonicera hispidula* var. *vacillans*, *Lotus americanus*, *L. argophyllus*, *L. nevadensis*, *L. oblongifolius*, *L. purshianus*, *L. scoparius*, *Marrubium vulgare*, *Melilotus alba*, *Monardella lanceolata*, *Penstemon*, *Phacelia distans*, *P. ramosissima*, *Salvia*, *Solidago californica*, *Stellaria longipes*, *Stephanomeria exigua*, *Trichostema lanceolatum*, *Wislizenia refracta*.

*Dianthidium robertsoni* Cockerell, 1904. South. Calif. Acad. Sci., Bul. 3: 4. ♀, ♂.

*Anthidiellum robertsoni* race *citrinellum* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 362. ♂.

Taxonomy: Michener, 1953. Kans. Univ. Sci. Bul. 35: 1046, figs. 121, 122, 128 (larva).

—Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 60-62, figs. 204-207, 228, map. 41 (geogr. and floral records).

Biology: Leech, 1947. Ent. Soc. Brit. Col., Proc. 44: 39, 2 figs. (nest). —Linsley, 1962. Ent. Soc. Amer., Ann. 55: 159-160, figs. 6-7 (sleep). —Grigarick and Stange, 1968. Calif. Ins. Survey, Bul. 9: 62, fig. 228 (nest, summary of literature).

**notatum rufimaculatum** Schwarz. Fla. Pollen: Unknown, but visits flowers of *Rhus*.

*Anthidiellum notatum* var. *rufimaculatum* Schwarz, 1926. Amer. Mus. Novitates 226: 15. ♂, ♀.

Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 21 (redescription).

Biology: Schwarz, 1928. N. Y. Ent. Soc., Jour. 36: 395, pl. 12, figs. 1A, 1B (nest).

**perplexum** (Smith). N. C. to Fla. Pollen: Unknown, but visits flowers of *Azalea*, *Amorpha*, *Bidens*, *Chrysopsis*, *Desmodium*, *Erigeron*, *Hypericum*, *Ilex*, *Kuhnistera*, *Linaria*, *Monarda*, *Ocimum*, *Polygonum*, *Psoralea*, *Ptilimnium*, *Rhus*, *Solidago*.

*Anthidium perplexum* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 214. ♀, ♂.

Taxonomy: Cresson, 1864. Ent. Soc. Phila., Proc. 2: 377. ♀, ♂.

### Genus HETEROSTELIS Timberlake

*Stelis* subg. *Heterostelis* Timberlake, 1941. N. Y. Ent. Soc., Jour. 49: 125.

Type-species: *Stelis anthidioides* Timberlake. Orig. desig.

Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 33-35, fig. 11, table 2 (eastern U. S. spp.). —Thorp, 1966. Kans. Ent. Soc., Jour. 39: 131-146, 16 figs. (N. Amer. spp.). —Pasteels, 1968. Nat. Canad. 95: 1057 (tax. status).

**anthidioides** (Timberlake). Calif.

*Stelis (Heterostelis) anthidioides* Timberlake, 1941. N. Y. Ent. Soc., Jour. 49: 123. ♀.

Taxonomy: Thorp, 1966. Kans. Ent. Soc., Jour. 39: 134, 141-142, fig. 8 (tax. characters, geogr. records).

**australis australis** (Cresson). N. J. to Fla.

*Stelis australis* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 92. ♀.

Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 33. ♀ (redescription).

—Thorp, 1966. Kans. Ent. Soc., Jour. 39: 136, figs. (tax. characters of male and female, geogr. and floral records).

**australis floridensis** Mitchell. Fla.

*Heterostelis australis floridensis* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 33, fig. 11. ♀, ♂.

Taxonomy: Thorp, 1966. Kans. Ent. Soc., Jour. 39: 136-137 (tax. characters).

**grossa** Mitchell. Fla. (Gainesville), Ala. (Ft. Morgan).

*Heterostelis grossa* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 35. ♀.

- Taxonomy: Thorp, 1966. Kans. Ent. Soc., Jour. 39: 134, 137-138, fig. 5 (tax. characters, geogr. record).
- hurdi** Thorp. Calif. Host: *Trachusa perdita* Ckll.  
*Heterostelis hurdi* Thorp, 1966. Kans. Ent. Soc., Jour. 39: 142, figs. 3, 9, 11, 13-16. ♀, ♂.
- Taxonomy: Thorp, 1966. Kans. Ent. Soc., Jour. 39: 143-144, figs. 14-16 (cocoon, larva, pupa).
- Biology: Thorp, 1966. Kans. Ent. Soc., Jour. 39: 132, 145 (nest, parasite).
- manni** (Crawford). Ariz. Host: *Trachusa manni* Cwfd.? *Stelis manni* Crawford, 1917. Ent. Soc. Wash., Proc. 19: 168. ♀.
- Taxonomy: Thorp, 1966. Kans. Ent. Soc., Jour. 39: 134, 140-141, fig. 7 (tax. characters).
- texana** Thorp. Tex. (Austin).  
*Heterostelis texana* Thorp, 1966. Kans. Ent. Soc., Jour. 39: 135, figs 2, 6, 12. ♂.

### Genus STELIS Panzer

Insofar as known the species of this genus are cleptoparasites, chiefly in the nests of pollen-collecting bees of the tribe Megachilini (*Ashmeadiella*, *Chalicodoma*, *Heriades*, *Hoplitis*, *Osmia*, *Proteridiades* and *Robertsonella*). However, one of our species has been reared from a nest of the genus *Anthidium* and some extralimital species of *Stelis* have been shown to be cleptoparasites in the nests of *Ceratina* and *Euglossa*.

Taxonomy: Cockerell, 1898. Entomologist 31: 166-167 (U. S. spp.). — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 35-47 figs. 12-14, table 2 (eastern U. S. spp.). — Rozen, 1966. N. Y. Ent. Soc., Jour. 74: 84-91, 18 figs. (immature stages). — Pasteels, 1968. Nat. Canad. 95: 1055-1063 (tax. status, affinities and origin).

### Genus STELIS Subgenus STELIS Panzer

*Stelis* Panzer, 1806. Krit. Rev. Insektenf. Deutschlands, v. 2, p. 246.

Type-species: *Apis punctulatissima* Kirby. Monotypic. (= *Apis aterrima* Panzer).

*Gyrodroma* Klug, 1807. Mag. Insektenk. 6: 198.

Type-species: *Apis punctulatissima* Kirby. Monotypic. (= *Apis aterrima* Panzer).

*Gymnus* Spinola, 1808. Insectorum Liguria, v. 2, p. 9.

Type-species: *Apis punctulatissima* Kirby. Monotypic. (= *Apis aterrima* Panzer).

*Ceraplastes* Gistel, 1848. Naturgesch. Thierr. f. hoh. Schul., p. x. Proposed unnecessarily to replace *Stelis*.

This subgenus does not occur in North America.

### Genus STELIS Subgenus PROTOSTELIS Friese

*Stelis* subg. *Protostelis* Friese, 1895. Die Bienen Europas v. 1, p. 25.

Type-species: *Stelis freygessneri* Friese. Desig. by Popov, 1938.

**arizonensis** Swenk. Ariz.

*Stelis* (*Microstelis*) *arizonensis* Swenk, 1915. Nebr. Univ., Studies 15: 189. ♀, ♂.

**costalis costalis** Cresson. Va. and Ky., south to Fla. and Tex.

*Stelis costalis* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 274. ♀, ♂.

*Stelis louisae* Cockerell, 1911. U. S. Natl. Mus., Proc. 40: 247. ♂.

Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 37-38, figs 12-13 (redescription).

**costalis floridana** Graenicher. Fla. Host: A resin-using anthidiine bee or a species of *Chalicodoma* subg. *Chelostomoides*.

*Stelis floridana* Graenicher, 1928. Ent. News 39: 282. ♀, ♂.

Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 38-39 (redescription).

Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 481-482 (cocoon, host).

**laticincta** Cresson. Calif.

*Stelis laticincta* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 92. ♀.

Taxonomy: Cockerell, 1904. South. Calif. Acad. Sci., Bul. 3: 3. ♂.

**perpulchra** Crawford. Ariz., Calif., Mexico (Baja California).

*Stelis perpulchra* Crawford, 1916. Insecutor Inscitiae Menstruus 4: 107. ♂.

Taxonomy: Cockerell, 1923. Calif. Acad. Sci., Proc. (4) 12: 89. ♀, ♂.

**rudbeckiarum** Cockerell. N. Mex., Ariz.

*Stelis rudbeckiarum* Cockerell, 1904. South. Calif. Acad. Sci., Bul. 3: 3. ♂.

*Stelis rudbeckiana* (!) Snow, 1906. Kans. Acad. Sci., Trans. 20: 138.

### Genus STELIS Subgenus MICROSTELIS Robertson

*Microstelis* Robertson, 1903. Amer. Ent. Soc., Trans. 29: 170.

Type-species: *Stelis lateralis* Cresson. Orig. desig.

**coarctatus** Crawford. Kans., Nev. (Elko County). Host: *Proteriades shoshone* Parker.

*Stelis coarctatus* Crawford, 1916. Insecutor Inscitiae Menstruus 4: 105. ♀.

Biology: Parker, 1976. Pan-Pacific Ent. 52: 78 (host).

**crassiceps** Cockerell. Colo. Host: *Hoplitis producta* (Cress.).

*Stelis crassiceps* Cockerell, 1926. Ann. and Mag. Nat. Hist. (9) 18: 625. ♂.

Biology: Hicks, 1926. Colo. Univ., Studies 15: 246 (host).

**lateralis** Cresson. Maine and Ont. to N. Dak., south to Ga. and Tex. Host: *Hoplitis cylindrica* (Cress.), *H. pilosifrons* (Cress.), *H. producta* (Cress.). Predator: *Philanthus pulcher* Dalla Torre.

*Stelis lateralis* Cresson, 1864. Ent. Soc. Phila., Proc. 2: 410. ♀.

Taxonomy: Robertson, 1898. Acad. Sci. St. Louis, Trans. 8: 48. ♂, ♀. —Michener, 1953. Kans. Univ. Sci. Bul. 35: 1048, figs. 114-116, 118 (larva). —Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 42-43, fig. 14 (redescription). —Rozen, 1966. N. Y. Ent. Soc., Jour. 74: 86-89, figs. 9-10 (larva).

Biology: Graenicher, 1905. Wis. Nat. Hist. Soc., Bul. 3: 153 (as *sermaculatus*). —Swenk, 1914. Nebr. Univ., Studies, 14: 5 (host). —Hicks, 1926. Colo. Univ., Studies 15: 217 (life history, host). —Rau, 1928. Psyche 35: 100 (life history, host). —Michener, 1955. Kans. Ent. Soc., Jour. 28: 83-86 (life history, host).

**maculata** (Provancher). B. C.

*Heriades maculatum* Provancher, 1888. Addit. Corr. Faune Ent. Canada, Hym., p. 323. ♀.

Taxonomy: Titus, 1906. Ent. Soc. Wash., Proc. 7: 162 (tax. characters).

**plena** (Provancher). Ont. (Ottawa).

*Heriades plenum* Provancher, 1888. Addit. Corr. Faune Ent. Canada, Hym., p. 425. ♂.

Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 43 (status).

**sexmaculata** Ashmead. Calif., Nev., ?Mo., ?Colo. Host: *Hoplitis brachyodonta* (Ckll.), *H. coleii* (Cwfd.), *H. grinnelli* Ckll., *H. hypocrita* (Ckll.), *H. producta gracilis* (Mich.), *H. producta producta* (Cress.), *Osmia glauca* (Fowler). Parasite: *Epistenia* sp., *Leucospis affinis* Say, *Microdontomerus anthidii* (Ashm.).

*Stelis 6-maculata* Ashmead, 1896. Ent. News 7: 218. ♀.

*Stelis sermaculata* Cockerell, 1898. Entomologist 31: 167. Emend.

Taxonomy: Cockerell, 1934. Amer. Mus. Novitates 732: 6. ♂. —Rust and Clement, 1972. Kans. Ent. Soc., Jour. 45: 526 (cocoon, host).

Biology: Davidson, 1896. Ent. News 7: 218 (host). —Davidson, 1897. South. Calif. Acad. Sci., Proc. 1: 4 (life history, hosts). —Hicks, 1926. Colo. Univ., Studies 15: 217 (life history, hosts). —Rau, 1928. Psyche 35: 100 (Colo. and Mo. records may refer to *lateralis*). —Parker and Bohart, 1966. Pan-Pacific Ent. 42: 98 (parasites).

**vernalis** Mitchell. Pa., N. C., Mich., Minn. Host: *Heriades carinata* Cress.

*Stelis (Microstelis) vernalis* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 43. ♀, ♂.

Biology: Matthews, 1965. Amer. Ent. Inst., Contrib. 1: 24-25 (behavior, host).

### Genus STELIS Subgenus PAVOSTELIS Sladen

*Stelis* subg. *Pavostelis* Sladen. 1916. Canad. Ent. 48: 313.

Type-species: *Stelis montana* Cresson. Monotypic.

**anthracina** Timberlake. Calif.

*Stelis (Pavostelis) anthracina* Timberlake, 1941. N. Y. Ent. Soc., Jour. 49: 125. ♂.

**ater** Mitchell. Fla.

*Stelis (Pavostelis) ater* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 39. ♀.

**callura** Cockerell. Colo., Utah.

*Stelis callura* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 212. ♂.

**carnifex** Cockerell. Nev., Calif.

*Stelis carnifex* Cockerell, 1911. Ann. and Mag. Nat. Hist. (8) 8: 769. ♀.

**diversicolor** Crawford. Tex. to Tenn. and N. C.

*Stelis diversicolor* Crawford, 1916. Insecutor Inscitiae Menstruus 4: 106. ♂.

Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 39-40, fig. 14 (redescription).

**fremonti** Cockerell. Oreg.

*Stelis fremonti* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 213. ♀.

**montana** Cresson. Alta., B. C., Wyo., Oreg., Colo., Utah, Ariz., Calif. Host: *Osmia montana*

Cress., *O. texana* Cress.

*Stelis montana* Cresson, 1864. Ent. Soc. Phila., Proc. 3: 39. ♀.

Biology: Rust, 1974. Wasmann Jour. Biol. 32: 80 (host).

**seneciophila** Cockerell. Colo.

*Stelis seneciophila* Cockerell, 1908. Ann. and Mag. Nat. Hist. (8) 2: 329. ♀.

### Genus STELIS Subgenus CHELYNIA Provancher

*Chelynia* Provancher, 1888. Addit. Corr. Faune Ent. Canada, Hym., p. 322.

Type-species: *Chelynia labiata* Provancher. Monotypic.

Taxonomy: Cockerell, 1898. Entomologist 31: 166-167. —Cockerell, 1936. Canad. Ent. 68: 275 (Key to U. S. spp.). —Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 36 (tax. status).

**calliphorina** (Cockerell). Calif.

*Chelynia calliphorina* Cockerell, 1911. Ann. and Mag. Nat. Hist. (8) 8: 769. ♀.

**chlorocyanea** (Cockerell). Calif. Host: *Osmia nigrifrons* Kll. Parasite: *Dibrachys* sp.

*Chelynia chlorocyanea* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 208. ♀.

Taxonomy: Rust and Thorp, 1973. Kans. Ent. Soc., Jour. 46: 548-562, 26 figs. 2 tables (immature stages).

Biology: Rust and Thorp, 1973. Kans. Ent. Soc., Jour. 46: 548-562 (life history, hosts). —Rust, Thorp and Torchio, 1974. Nat. Hist., Jour. 8: 44 (host).

**cusackae** (Cockerell). Colo.

*Chelynia cusackae* Cockerell, 1910. Ent. News 21: 270. ♀.

**depressa** Timberlake. Calif.

*Stelis (Chelynia) depressa* Timberlake, 1941. N. Y. Ent. Soc., Jour. 49: 127. ♀, ♂.

**elegans** Cresson. B. C., Colo., Ariz.

*Stelis elegans* Cresson, 1864. Ent. Soc. Phila., Proc. 2: 411. ♂ (♀ misdet.).

**federalis** Smith. N. B. to Minn., south Ga. and Colo. Host: *Hoplitis cylindrica* (Cress.), *Osmia atriventris* Cress.

*Stelis federalis* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 275. ♀, ♂.

Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 45, figs. 12-13 (redescription).

**fragariella** (Cockerell). Calif.

*Chelynia fragariella* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 209. ♂.

**franciscana** (Cockerell). Calif.

*Chelynia franciscana* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 207. ♀.

**holocyanea** (Cockerell). Calif.

*Chelynia holocyanea* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 209. ♀.

**idahoensis** Swenk. Idaho.

*Stelis (Chelynia) idahoensis* Swenk, 1914. Nebr. Univ., Studies 14: 6. ♀.

- Taxonomy: Cockerell, 1936. *Canad. Ent.* 68: 275 (tax. characters).
- interrupta** Cresson. Nev.  
*Stelis interrupta* Cresson, 1897. *Amer. Ent. Soc., Trans.* 7: 205. ♀.
- labiata** (Provancher). Que. to Wis., south to N. C. and Tex.? Host: *Hoplitis anthocopoides* (Schenck), *H. cylindrica* (Cress.), *H. pilosifrons* (Cress.), *H. producta* (Cress.), *H. simplex* (Cress.).  
*Chelynia labiata* Provancher, 1888. *Addit. Corr. Faune Ent. Canada*, Hym., p. 322. ♀, ♂.  
*?Stelis (Microstelis) birkmanni* Cockerell, 1909. *Ann. and Mag. Nat. Hist.* (8) 4: 29. ♂.
- Taxonomy: Mitchell, 1962. *N. C. Agr. Expt. Sta. Tech. Bul.* 152: 40-42, fig. 13 (redescription, synonymy).
- Biology: Eickwort, 1973. Search, Cornell Univ. Agr. Expt. Sta. 3: 27 (host relationships).
- leucotricha** (Cockerell). Calif. Host: *Anthidium mormonum* Cress.  
*Chelynia leucotricha* Cockerell, 1925. *Calif. Acad. Sci., Proc.* (4) 14: 208. ♀, ♂.
- Biology: Hicks, 1929. *Ent. News* 40: 108. (host).
- linsleyi** Timberlake. Calif.  
*Stelis (Chelynia) linsleyi* Timberlake, 1941. *N. Y. Ent. Soc., Jour.* 49: 129. ♀.
- melanotricha** (Cockerell). Colo.  
*Chelynia melanotricha* Cockerell, 1925. *Ann. and Mag. Nat. Hist.* (9) 16: 626. ♀.
- michiganensis** Mitchell. Mich. (Luce Co.).  
*Stelis michiganensis* Mitchell, 1962. *N. C. Agr. Expt. Sta. Tech. Bul.* 152: 45. ♀.
- monticola** Cresson. B. C., Idaho, Wyo., Colo. Host: *Hoplitis fulgida* Cress.  
*Stelis? monticola* Cresson, 1878. *Amer. Ent. Soc., Trans.* 7: 94. ♀.
- Biology: Hicks, 1926. *Colo. Univ., Studies* 15: 243 (host).
- nitida** Cresson. Canada, N. Y., Wis., N. C.  
*Stelis? nitida* Cresson, 1878. *Amer. Ent. Soc., Trans.* 7: 92. ♀.
- Taxonomy: Mitchell, 1962. *N. C. Agr. Expt. Sta. Tech. Bul.* 152: 46-47 (redescription).
- nitidula** (Cockerell). Calif.  
*Chelynia nitidula* Cockerell, 1925. *Calif. Acad. Sci., Proc.* (4) 14: 210. ♂.
- Taxonomy: Cockerell, 1936. *Canad. Ent.* 68: 274 (tax. characters).
- pavonina** (Cockerell). Wyo., Colo.  
*Chelynia pavonina* Cockerell, 1908. *Ann. and Mag. Nat. Hist.* (8) 1: 339. ♂.
- Taxonomy: Cockerell, 1922. *Amer. Mus. Novitates* 40: 7. ♂, ♀.
- pulchra** Crawford. Nebr., Colo.  
*Stelis pulchra* Crawford, 1902. *Canad. Ent.* 34: 239. ♀.
- semirubra reducta** Snelling. Calif. (Tuolumne and Mariposa counties).  
*Stelis (Chelynia) semirubra reducta* Snelling, 1962. *Pan-Pacific Ent.* 38: 227. ♀, ♂.
- semirubra semirubra** Timberlake. Calif.  
*Stelis (Chelynia) semirubra* Timberlake, 1941. *N. Y. Ent. Soc., Jour.* 49: 127. ♀.
- subcaerulea** Cresson. Wyo., Nev., Calif.  
*Stelis? subcaerulea* Cresson, 1878. *Amer. Ent. Soc., Trans.* 7: 93. ♂.
- Taxonomy: Cockerell, 1911. *Ann. and Mag. Nat. Hist.* (8) 8: 768. ♂, ♀.
- submarginata** Cresson. N. B., Ont., Man., Wis., N. Dak., Wyo., Idaho, Colo. Host: *Hoplitis albifrons* (Kirby), *H. cylindrica* (Cress.), *Osmia proxima* Cress., *O. simillima* Sm.  
*Stelis? submarginata* Cresson, 1878. *Amer. Ent. Soc., Trans.* 7: 93. ♀.
- Taxonomy: Swenk, 1915. *Nebr. Univ., Studies* 15: 191. ♂. — Mitchell, 1962. *N. C. Agr. Expt. Sta. Tech. Bul.* 152: 47 (redescription).
- Biology: Graenicher, 1935. *Ent. Soc. Amer., Ann.* 28: 300 (host). — Fye, 1965. *Canad. Ent.* 97: 865 (hosts).
- subglauca** (Cockerell). Wash.  
*Chelynia subglauca* Cockerell, 1925. *Calif. Acad. Sci., Proc.* (4) 14: 210. ♂.

Genus *STELIS* Subgenus *MELANOSTELIS* Ashmead

*Melanostelis* Ashmead, 1898. Psyche 8: 283.

Type-species: *Chelynia rubi* Cockerell. Monotypic and orig. desig. (= *Melanostelis betheli* Ashmead).

*ricardonis* (Cockerell). B. C.

*Chelynia ricardonis* Cockerell, 1912. Canad. Ent. 44: 293. ♀.

*rubi* Cockerell. B. C., Alta., Wash., Calif., Colo.

*Stelis rubi* Cockerell, 1898. Entomologist 31: 167. ♀.

*Melanostelis betheli* Ashmead, 1898. Psyche 8: 283. ♀.

Taxonomy: Swenk, 1914. Nebr. Univ. Studies 14: 8. ♀, ♂.

Genus *STELIS* Subgenus *STELIDIUM* Robertson

*Stelidium* Robertson, 1902. Canad. Ent. 24: 323.

Type-species: *Stelidium trypetinum* Robertson. Monotypic and orig. desig.

*ashmeadiellae* Timberlake. Calif. Host: *Ashmeadiella californica* (Ashm.).

*Stelis (Stelidium) ashmeadiellae* Timberlake, 1941. N. Y. Ent. Soc., Jour. 49: 133. ♀, ♂.

Biology: Timberlake, 1941. N. Y. Ent. Soc., Jour. 49: 134 (host).

*nyssonoides* (Brues). Tex.

*Melanostelis nyssonoides* Brues, 1903. Ent. News 14: 84. ♀.

*palmarum* Timberlake. Calif.

*Stelis (Stelidium) palmarum* Timberlake, 1941. N. Y. Ent. Soc., Jour. 49: 134. ♀.

*permaculata* Cockerell. Colo., N. Mex. Host: *Heriades carinata* Cress.?

*Stelis lateralis* var. *permaculata* Cockerell, 1898. Entomologist 31: 167. ♂.

Biology: Hicks, 1927. Ent. News 38: 297 (host).

*robertsoni* Timberlake. Calif.

*Stelis (Stelidium) robertsoni* Timberlake, 1941. N. Y. Ent. Soc., Jour. 49: 136. ♀, ♂.

*trypetina* (Robertson). Ill., Ont., Va.

*Stelidium trypetinum* Robertson, 1902. Canad. Ent. 34: 323. ♀.

*Stelis (Stelidium) ontariana* Sladen, 1916. Canad. Ent. 48: 312. ♀, ♂.

Taxonomy: Cockerell, 1922. Canad. Ent. 54: 143 (tax. characters). — Mitchell, 1962. N. C. Agr.

Expt. Sta. Tech. Bul. 152: 44-45 (redescription).

Genus *STELIS* Subgenus *STELIDINA* Timberlake

*Stelis* subg. *Stelidina* Timberlake, 1941. N. Y. Ent. Soc., Jour. 49: 125.

Type-species: *Stelis hemirhoda* Linsley. Orig. desig.

*Stelidella* (!) Timberlake, 1941. N. Y. Ent. Soc., Jour. 49: 133.

Revision: Linsley, 1939. Ent. News 50: 255.

*acutiventris* Linsley. Calif.

*Stelis (Stelidium) acutiventris* Linsley, 1939. Ent. News 50: 252. ♀.

*cockerelli* (Hicks). Calif.

*Herbstiella cockerelli* Hicks, 1933. Amer. Mus. Novitates 616: 1. ♀.

*hemirhoda* Linsley. Calif.

*Stelis (Stelidium) hemirhoda* Linsley, 1939. Ent. News 50: 250. ♀, ♂.

*micheneri* Linsley. Calif.

*Stelis (Stelidium) micheneri* Linsley, 1939. Ent. News 50: 253. ♀, ♂.

*nigriventris* Timberlake. Calif.

*Stelis (Stelidina) nigriventris* Timberlake, 1941. N. Y. Ent. Soc., Jour. 49: 132. ♀.

*trichopyga* Timberlake. Calif.

*Stelis (Stelidina) trichopyga* Timberlake, 1941. N. Y. Ent. Soc., Jour. 49: 130. ♀.



## UNPLACED TAXON OF STELIS

The following species can neither be recognized as to subgenus nor associated with any of the described species of *Stelis* in North America, but is a member of the genus *Stelis*.

*Andrena nigrita* Fabricius, 1775. *Systema Ent.*, p. 377. "Habitat in America."

## NOMEN NUDUM IN STELIS PANZER

*Stelis foxi* Smith, 1910 (1909). N. J. State Mus., Ann. Rpt., p. 695.

## Genus DIOXYS Lepeletier and Serville

*Dioxys* Lepeletier and Serville, 1825. *Encycl. Meth.*, Dict. Ins., v. 10, p. 109.

Type-species: *Trachusa cincta* Jurine. Monotypic.

*Paradioxys* Mocsary, 1894. *Termes. Fuzetek*, v. 17, p. 35.

Type-species: *Dioxys pannonica* Mocsary. Monotypic.

*Hoplopassites* Ashmead, 1898. *Psyche* 8: 284.

Type-species: *Phileremus? productus* Cresson. Monotypic and orig. desig.

*Chrysopheon* Titus, 1901. *Canad. Ent.* 33: 256.

Type-species: *Chrysopheon aurifuscus* Titus. Monotypic.

Revision: Hurd, 1958. *Calif. Univ. Pubs. Ent.* 14: 275-302, 28 figs., 4 maps. (Nearctic spp.).

Taxonomy: Cockerell, 1928. *Colo. Univ., Studies* 16: 111 (synopsis). — Rozen, 1967. *N. Y. Ent. Soc., Jour.* 75: 236-248, 31 figs. (immature stages).

Biology: Hurd, 1958. *Calif. Univ. Pubs. Ent.* 14: 276 (floral and host relationships).

**aurifuscus** (Titus). Colo., Idaho, Calif., Oreg. Host: *Anthidium maculosum* Cress.?,

*Callanthidium illustre* Cress.

*Chrysopheon aurifuscus* Titus, 1901. *Canad. Ent.* 33: 256. ♀.

*Dioxys fulvohirta* Duce, 1909. *Rev. de Ent.* 27: 44. ♀.

Taxonomy: Horning, 1966. *Ent. Soc. Wash., Proc.* 68: 157 (geogr. records).

Biology: Cockerell, 1909. *Canad. Ent.* 41: 334 (host). — Hicks, 1929. *Canad. Ent.* 61: 8 (host).

— Horning, 1971. *Ent. Soc. Wash., Proc.* 73: 43 (host).

**pacificus melanogaster** Hurd. South. Calif. (San Bernardino, San Gabriel and San Jacinto Mts.).

*Dioxys pacificus melanogaster* Hurd, 1958. *Calif. Univ. Pubs. Ent.* 14: 296. ♀, ♂.

**pacificus pacificus** Cockerell. Calif. (except mts. of Southern Calif.), Oreg., Nev., Utah, Wyo.

*Dioxys pacificus* Cockerell, 1916. *Ann. and Mag. Nat. Hist.* (8) 17: 286. ♀.

**pomonae pomonae** Cockerell. Idaho, Utah, Colo., N. Mex., Ariz., Oreg. and Calif. (except Sonoran Desert). Host: *Anthidium collectum* Huard, *Chalicodoma suberilis* (Ckll),

*Osmia nifoata* Ckll, *O. nigrobarbata* Ckll.

*Dioxys pomonae* Cockerell, 1910. *Canad. Ent.* 42: 169. ♂.

*Dioxys phaceliae* Cockerell, 1911. *Amer. Ent. Soc., Trans.* 37: 235. ♀.

*Dioxys catalinensis* Cockerell, 1938. *Ann. and Mag. Nat. Hist.* (11) 2: 148. ♂.

Taxonomy: Cockerell, 1916. *Ann. and Mag. Nat. Hist.* (8) 17: 285. ♀. — Gittins, 1959. *Brooklyn Ent. Soc., Bul.* 54: 135 (geogr. records). — Horning, 1966. *Ent. Soc. Wash., Proc.* 68: 157 (floral and geogr. records). — Rozen, 1967. *N. Y. Ent. Soc., Jour.* 75: 236-248, 31 figs. (immature stages).

Biology: Rozen and Favreau, 1967. *N. Y. Ent. Soc., Jour.* 75: 197-203, 7 figs. (life history, host).

**pomonae timberlakei** Hurd. Southern Calif., deserts.

*Dioxys pomonae timberlakei* Hurd, 1958. *Calif. Univ. Pubs. Ent.* 14: 285. ♀, ♂.

**productus cismontanicus** Hurd. Pacific slope of Calif.; Mexico (Baja California). Host:

*Anthidium collectum* Huard.

*Dioxys productus cismontanicus* Hurd, 1958. *Calif. Univ. Pubs. Ent.* 14: 290. ♀, ♂.

**productus productus** (Cresson). Great Basin of Calif., Nev., Wash., Oreg., Utah. Host:

*Anthidium utahense* Swenk.

*Phileremus? productus* Cresson, 1879. *Amer. Ent. Soc., Trans.* 7: 203. ♀.

Taxonomy: Ducke, 1909. Rev. de Ent. 27: 44 (tax. characters). — Horning, 1966. Ent. Soc. Wash., Proc. 68: 157 (geogr. record). — Rozen, 1967. N. Y. Ent. Soc., Jour. 75: 2, 36, 238-239, 240, 242, figs. 9-15 (larva, as *productus productus*?).

Biology: Jaycox, 1966. Pan-Pacific Ent. 42: 18-20 (habits, host).

**productus subruber** (Cockerell). Calif. deserts, Ariz., N. Mex., western Tex. Host: *Anthidium paroselae* Kll.

*Phileremus productus* var. *subruber* Cockerell, 1898. N. Mex. Univ., Bul. 1: 60. ♀.

*Dioxys martii* Cockerell, 1902. Ann. and Mag. Nat. Hist. (7) 9: 233. ♀ (= male).

Biology: Newberry, 1900. Psyche 9: 94 (host).

**rohweri** Cockerell. Colo. (Troublesome).

*Dioxys rohweri* Cockerell, 1908. Ann. and Mag. Nat. Hist. (8) 2: 329. ♂.

#### TRIBE MEGACHILINI

The tribe Megachilini, which contains the well known leaf-cutter and mason bees, is represented by numerous species throughout much of the world. Although some of these bees are cleptoparasites, mainly in the nests of other Megachilini, most members of this tribe are pollen-collecting bees, and like the Anthidiini make use of a wide variety of foreign materials for the construction of the cells in their nests. However, unlike the Anthidiini some of these bees utilize mud for cell construction, but none is known to use plant down for this purpose. Some of the species live in colonies (e.g., certain *Chalicodoma* and *Osmia*) which are communal and even possibly quasisocial, but the majority of the species are solitary. Most of the species appropriate a wide variety of pre-existing holes and cavities of all sorts in which to make their nests, but some of them do excavate their own tunnels in the ground. In some classifications the tribe Megachilini is divided into two subtribes, the Osmiini (arolium present) and the Megachilini (arolium absent).

Taxonomy: Michener, 1941. Amer. Midland Nat. 26: 147-167 (partial generic revision).

— Michener, 1944. Amer. Nat. 78: 257-266, 1 fig. (distribution of osmine bees of the N. Amer. deserts). — Hurd and Michener, 1955. Calif. Ins. Survey Bul. 3: 1-248, 141 figs., 112 maps (Calif. spp. except of *Osmia*, *Megachile*, and *Coelioxys*). — Michener and Sokal, 1957. Evolution 11: 130-162, 15 figs., 4 tables (genera of *Hoplitis* complex). — Sokal and Michener, 1958. Kans. Univ. Sci. Bul. 38: 1409-1438 (statistical evaluation of systematic relationships in the *Hoplitis* complex). — Michener, 1962. N. Y. Ent. Soc., Jour. 70: 17-29 (classification of bees commonly placed in the genus *Megachile*). — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 48-232, figs. 1, 15-66, tables 3-7 (eastern U. S. spp.). — Rubin, 1966. Syst. Zool. 15: 169-182, 3 tables (homogeneous groups in the *Hoplitis* complex). — Michener and Sokal, 1966. Ent. Soc. Amer., Ann. 59: 1211-1217, 5 figs. (phenetic similarities in the *Hoplitis* complex). — Sokal and Michener, 1967. Linn. Soc. London, Proc. 178: 59-74 (effects of different numerical techniques on the phenetic classification of the *Hoplitis* complex).

Biology: Eickwort, 1975. Evolution 29: 142-150, 1 fig., 2 tables (evolution of parasitism and sociality in *Hoplitis*).

#### Genus HERIADES Spinola

The bees of this genus nest in small holes, such as those made by emerging beetles in old logs, dead branches, and pine cones. Insofar as known, the species are polylectic and have rather long seasons of flight.

Revision: Michener, 1938. Ent. Soc. Amer., Ann. 31: 514-531 (Amer. spp.). — Hurd and Michener, 1955. Calif. Ins. Survey, Bul. 3: 11-24, pls. 3, 12, figs. 7-16, maps 2-7 (Calif. spp.). — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 48-52, figs. 1, 15, table 3 (eastern U. S. spp.).

#### Genus HERIADES Subgenus HERIADES Spinola

*Heriades* Spinola, 1808. Insectorum Liguria, v. 2, p. 7.

Type-species: *Apis truncorum* Linnaeus. Desig. by Latreille, 1810.

*Trypetes* Schenck, 1859. Nassau. Ver. f. Naturk. Jahrb. 14: 32. Preocc.

Type-species: *Apis truncorum* Linnaeus. Monotypic.

This subgenus is not found in America.

### Genus HERIADES Subgenus NEOTRYPTETES Robertson

*Neotryptetes* Robertson, 1918. Ent. News 29: 92.

Type-species: *Megachile variolosa* Cresson. Monotypic and orig. desig. (= *Trypetes productus* Robertson).

Taxonomy: Michener, 1954. Kans. Ent. Soc., Jour. 27: 68-69 (rev. key to spp.).

**crucifera** Cockerell. N. Mex., Ariz.

*Heriades crucifera* Cockerell, 1897. Ann. and Mag. Nat. Hist. (6) 20: 137. ♂.

**leavitti** Crawford. N. B. and Maine, south to Fla., west to Tex. and Wyo. Pollen: Polylectic, visits a wide variety of flowers including *Anthemis cotulla*, *Bidens*, *Chrysopsis*, *Erigeron*, *Galax*, *Helenium*, *Ilex*, *Jussiaea*, *Melilotus officinalis*, *Oenothera*, *Polygonum*, *Senecio*, *Solidago*, *Stokesia*.

*Heriades leavitti* Crawford, 1913. Canad. Ent. 45: 270. ♂.

*Heriades crawfordi* Graenicher, 1928. Ent. News 39: 281. ♀, ♂.

†*Neotryptetes truncatus* Robertson, 1929. Flowers and Insects, p. 131. ♀, ♂.

Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 278-279 (nest architecture, life history).

**micheneri** Timberlake. Ariz.

*Heriades (Neotryptetes) micheneri* Timberlake, 1947. Pan-Pacific Ent. 23: 26. ♂, ♀.

**microphthalma** Michener. Deserts of west. Tex., N. Mex., Ariz., Utah. Pollen: Apparently polylectic, visits flowers of *Melilotus officinalis*, *Monarda*, *Petalostemon*, *Tetradymia canescens*.

*Heriades microphthalma* Michener, 1954. Kans. Ent. Soc., Jour. 27: 66, 2 figs. ♀, ♂.

**texana** Michener. Tex., Ariz.

*Heriades texana* Michener, 1938. Ent. Soc. Amer., Ann. 31: 517. ♀.

**variolosa purpurascens** Cockerell. South. Tex. to Yucatan.

*Heriades carinata purpurascens* Cockerell, 1931. Ann. and Mag. Nat. Hist. (10) 8: 543. ♀.

Taxonomy: Michener, 1949. Kans. Ent. Soc., Jour. 22: 43.

**variolosa variolosa** (Cresson). Ont. and Maine, south to Fla., west to B. C., Wash., Oreg., Utah, Colo., N. Mex. and Tex; Mexico (northern). Ecology: Nests in twigs of sumac. Pollen: Polylectic, principally Compositae, but visits a wide variety of flowers including *Amorpha*, *Apocynum*, *Asclepias*, *Aster*, *Berteroa*, *Bidens*, *Blephilia*, *Brassica*, *Ceanothus*, *Cirsium*, *Coreopsis*, *Erigeron philadelphicus*, *Grindelia*, *Gutierrezia sarothrae*, *Helianthus*, *Heliopsis helianthoides*, *Houstonia*, *Malva silvestris*, *Melilotus alba*, *Mentha canadensis*, *Monarda*, *Parthenium*, *Prunus*, *Ratibida*, *Senecio*, *Solidago rigida*, *Thelesperma gracile*, *Toxicodendron*, *Trifolium*, *Vernonia*.

*Megachile variolosa* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 270. ♀.

*Heriades odontophora* Schletterer, 1889. Zool. Jahrb., Abt. f. System., Geog. u. Biol. Tiere 4: 679. ♀.

*Heriades asteris* Cockerell, 1897. Ann. and Mag. Nat. Hist. (6) 20: 135. ♂.

*Trypetes barbatus* Robertson, 1903. Amer. Ent. Soc., Trans. 29: 171. ♂ (♀ misdet.).

*Trypetes productus* Robertson, 1905. Canad. Ent. 37: 236. ♂.

Biology: Fischer, 1955. Canad. Ent. 87: 33-36 (nest).

### Genus HERIADES Subgenus PHYSOSTETHA Michener

*Heriades* subg. *Physostetha* Michener, 1938. Ent. Soc. Amer., Ann. 31: 523.

Type-species: *Heriades carinata* Cresson. Orig. desig.

**carinata** Cresson. N. B. and Que. to Fla., west to B. C., Oreg., Utah, N. Mex., and Tex.

Parasite: *Leucospis affinis* Say, *Melittobia chalybii* Ashm., *Şapyga louisii* Krombein, *Stelis permaculata* Ckll., *S. vernalis* Mitchell. Pollen: Polylectic, visits a wide variety of flowers including *Apocynum*, *Aronia*, *Asclepias syriaca*, *Cichorium intybus*, *Cleome*

- serrulata*, *Erigeron*, *Fayopyrum*, *Helianthus*, *Ilex*, *Medicago sativa*, *Melilotus alba*, *M. officinalis*, *Mentha canadensis*, *Monarda fistulosa*, *Parthenocissus quinquefolia*, *Penstemon*, *Petalostemon candidus*, *Polygonum scandens*, *Potentilla*, *Rhus glabra*, *R. typhina*, *Rubus*, *Senecio*, *Solidago*, *Trifolium*, *Vicia*.
- Heriades carinatum* Cresson, 1864. Ent. Soc. Phila., Proc. 2: 383. ♀, ♂.
- Heriades glomerans* Schletterer, 1889. Zool. Jahrb., Abt. f. System., Geog. u. Biol. Tiere 4: 681. ♀.
- Biology: Rau, 1922. Acad. Sci. St. Louis, Trans. 24 (7): 39-40 (nest). —Matthews, 1965. Amer. Ent. Inst. Contrib. 1: 1-33, 23 figs., 7 tables (nest, life history, immature stages, parasites). —Krombein, 1967. Trap-nesting wasps and bees, pp. 279-282 (nest architecture, life history, supersedure).
- cressoni* Michener. Nebr. to N. Mex., west to B. C. and Calif. Pollen: Polylectic, visits a wide variety of flowers including *Achillea lanulosa*, *Aster adscendens delectabilis*, *A. canescens*, *A. parishii*, *Calycadenia multiglandulosa*, *Chrysopsis*, *Chrysothamnus pumilus*, *C. viridulus*, *Chamaenerion angustifolium*, *Cirsium californicum*, *Erigeron foliosus* var. *stenophyllus*, *Eriogonum elongatum*, *E. latifolium* var. *nudum*, *Eriophyllum confertiflorum*, *Gayophytum ramosissimum*, *Geranium richardsoni*, *Gutierrezia californica*, *Haplopappus gracilis*, *Helienium bigelovii*, *Heteromeles arbutifolia*, *Potentilla gracilis*, *P. glandulosa*, *Senecio ionophyllus*, *Solidago californica*, *S. confinis*, *S. petradoria*.
- Heriades (Phystostetha) cressoni* Michener, 1938. Ent. Soc. Amer., Ann. 31: 529. ♀, ♂.
- gracilior* Cockerell. Colo., N. Mex., Ariz., Nev. and south. Calif. Pollen: Unknown, but visits flowers of *Convolvulus arvensis*, *Opuntia*.
- Heriades gracilior* Cockerell, 1897. Ann. and Mag. Nat. Hist. (6) 20: 138. ♂, ♀.
- occidentalis* Michener. Oreg., Calif. Ecology: Nests in abandoned beetle burrows in cones of *Pinus attenuata*. Pollen: Polylectic, visits a wide variety of flowers including *Adenostoma fasciculatum*, *Angelica tomentosa*, *Asclepias fascicularis*, *Baccharis douglasii*, *Cirsium vulgare*, *Cordylanthus*, *Cryptantha intermedia*, *Eriogonum fasciculatum*, *Eriogonum latifolium* var. *nudum*, *Eriodictyon trichocalyx*, *Eriophyllum lanatum*, *Eryngium aristatum*, *Gnaphalium thermale*, *Haplopappus squarrosus*, *Helianthus scoparius*, *Helianthus gracilentus*, *Hemizonia paniculata*, *Heteromeles arbutifolia*, *Lonicera interrupta*, *Lotus*, *Nolina parryi*, *Opuntia occidentalis*, *Phacelia imbricata*, *Rhus integrifolia*, *Sidalcea malvaeflora*, *Solidago californica*, *S. occidentalis*, *Stephanomeria*, *Suertia parryi*, *Tetradymia canescens*, *Verbena lasiostachys*.
- Heriades (Phystostetha) occidentalis* Michener, 1938. Ent. Soc. Amer., Ann. 31: 525. ♀, ♂.
- timberlakei* Michener. Ariz., Nev., N. Mex., Colo. Pollen: Unknown, but visits flowers of *Euphorbia albomarginata*.
- Heriades (Phystostetha) timberlakei* Michener, 1938. Ent. Soc. Amer., Ann. 31: 527. ♂, ♀.

### Genus PROCHELOSTOMA Robertson

*Prochelostoma* Robertson, 1903. Amer. Ent. Soc., Trans. 29: 167.

Type-species: *Heriades philadelphii* Robertson. Monotypic and orig. desig.

Revision: Michener, 1938. Ent. News 69: 131.

*philadelphii* (Robertson). N. Y. to Ga., west to Mich., Ill., Kans. and Miss. Ecology: Nests in deserted anobiid borings and trap-nests. Parasite: *Melittobia chalybii* Ashm., *Pyemotes ventricosus* (Newport). Pollen: Unknown, but visits flowers of *Capsella*, *Crataegus*, *Ellisia*, *Geranium*, *Hydrophyllum*, *Ilex*, *Philadelphicus*, *Rubus*. Predator: *Trogoderma ornatum* Say.

*Heriades philadelphii* Robertson, 1891. Amer. Ent. Soc., Trans. 18: 64. ♀, ♂.

Biology: Krombein, 1959. Ent. News 70: 135-136 (nest, mating). —Krombein, 1967.

Trap-nesting wasps and bees, pp. 276-278, pl. 17, fig. 86 (nest architecture, life history, supersedure, parasites).

### Genus CHELOSTOMA Latreille

*Chelostoma* Latreille, 1809. Gen. Crust. Ins., v. 4, p. 16.

Type-species: *Apis florissomnis* Linnaeus. Monotypic. (= *Apis maxillosa* Linnaeus).

*Gyrodroma* Thomson, 1872. Hym. Scand., v. 2, p. 259. Preoc.

Type-species: *Heriades nigricornis* Nylander. Desig. by Cockerell, 1925.

Nearctic species of this genus visit flowers of Hydrophyllaceae, especially the genera *Phacelia* and *Eriodictyon*, and possibly collect pollen exclusively from these flowers.

Revision: Michener, 1938. Pan-Pacific Ent. 14: 36-45.

**bernardinum** Michener. South. Calif. Pollen: Unknown, but visits flowers of *Nemophila integrifolia*, *N. menziesii*, *N. spatulata*, *Phacelia davidsonii*.

*Chelostoma bernardinum* Michener, 1938. Pan-Pacific Ent. 14: 40. ♀, ♂.

**californicum** Cresson. Calif.; Mexico (Baja California). Pollen: Apparently oligolectic on flowers of *Phacelia* including *P. ciliata*, *P. davidsonii*, *P. distans*, *P. hispida*, *P. imbricata*, *P. platyloba*, *P. ramosissima*, but visits other flowers presumably for nectar including *Cryptantha intermedia*, *C. flaccida*, *Eriodictyon californicum*, *E. trichocalyx*, *Hesperochiron californicum*, *Layia platyglossa*, *Nemophila menziesii*, *N. integrifolia*, *Plagiobothrys nothofolius*, *Salvia cernosa*.

*Chelostoma californicum* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 108. ♂.

*Heriades albicinctum* Provancher, 1895. Nat. Canad. 22: 190. ♀, ♂.

*Heriades odontura* Cockerell, 1902. South. Calif. Acad. Sci., Bul. 1: 139. ♂.

*Robertsonella dolichosoma* Cockerell, 1922. Ann. and Mag. Nat. Hist. (9) 10: 456. ♀.

**cockerelli** Michener. South. Calif. Pollen: Apparently oligolectic on flowers of *Eriodictyon* including *E. californicum*, *E. crassifolium*, *E. trichocalyx*, but visits other flowers including *Clarkia*, *Cryptantha intermedia*, *Gilia exilis*, *Lotus scoparius*, *Mimulus fremontii*, *Nama parryi*, *Navarretia heterodoxa*, *Penstemon*, *Phacelia distans*, *P. tanacetifolia*, *Trichostema lanatum*, *T. parishii*, *Verbena lasiostachys*, *Viguiera deltoidea*.

*Chelostoma minutum cockerelli* Michener, 1938. Pan-Pacific Ent. 14: 43. ♂, ♀.

**incisulum** Michener. Calif. Pollen: Apparently oligolectic on flowers of *Phacelia* including *P. distans*, *P. platyloba*, but also visits flowers of *Ceanothus*, *Cryptantha*, *Gilia tricolor*, *Hesperochiron californicus*, *Lasthenia chrysostoma*, *Linanthus aureus*.

*Chelostoma minutum incisulum* Michener, 1938. Pan-Pacific Ent. 14: 44. ♂.

**marginatum incisuloides** Michener. Cent. Calif. Pollen: Apparently oligolectic on flowers of *Phacelia* including *P. platyloba*, but also visits other flowers including *Amsinckia*, *Cryptantha*, *Eriodictyon californicum*, *Nemophila pulchella*, *Penstemon laetus*.

*Chelostoma marginatum incisuloides* Michener, 1954. Kans. Ent. Soc., Jour. 27: 69. ♂, ♀.

**marginatum marginatum** Michener. South Calif. Pollen: Apparently oligolectic on flowers of *Phacelia* including *Phacelia davidsonii*, *P. distans*, *P. hispida*, *P. minor*, but also visits other flowers including *Allium parvum*, *Cryptantha intermedia*, *Eriodictyon crassifolium*, *Lomatium dasycarpum*, *Nemophila pulchella*, *Rhamnus crocea*, *Rhus trilobata*, *Salvia columbariae*, *S. mellifera*.

*Chelostoma minutum marginatum* Michener, 1938. Pan-Pacific Ent. 14: 44. ♂, ♀.

**minutum** Crawford. Wash., Oreg., Utah, Nev., Calif. (Sierra Nevada and San Bernardino Mts.), Idaho. Pollen: Presumably oligolectic on *Phacelia* including *P. californica*, *P. davidsonii*, *P. distans*, *P. heterophylla*, *P. imbricata*, *P. linearis*, *P. ramosissima*, but also visits other flowers including *Allium parvum*, *Calochortus*, *Cryptantha*, *Draperia systyla*, *Erigeron divergens*, *Eriodictyon crassifolium*, *E. trichocalyx*, *Eriophyllum lanatum*, *Erysimum asperum*, *Heuchera micrantha*, *Lepidium virginicum*, *Lotus argophyllus*, *Mimulus fremontii*, *Nemophila menziesii*, *Penstemon spectabilis*, *Polemonium*, *Potentilla glandulosa*, *Sidalcea malvaeflora*.

*Chelostoma minuta* Crawford, 1916. Insector Inscitiae Menstruus 4: 102. ♀.

**phaceliae** Michener. Wash., Oreg., Calif., Nev. Pollen: Apparently oligolectic on *Phacelia* including *P. californica*, *P. distans*, *P. heterophylla*, *P. hispida*, *P. imbricata*, *P. linearis*, *P. ramosissima*, *P. tanacetifolia*, but also visits other flowers including *Allium dichlamydidum*, *Brodiaea lara*, *Calochortus*, *Clarkia dudleyana*, *C. pulchella*, *C. rhomboidea*, *Cryptantha intermedia*, *Erigeron foliosus* var. *stenophyllus*, *Eriodictyon californicum*, *E. crassifolium*, *Gilia exilis*, *Horkelia bolanderi*, *Lepechinia calcycina*,

*Lotus scoparius*, *Mimulus fremontii*, *Monardella lanceolata*, *Nama parryi*, *Nasturtium officinale*, *Polemonium*, *Potentilla glandulosa*, *Sidalcea malvaeflora*.

*Chelostoma phaceliae* Michener, 1938. Pan-Pacific Ent. 14: 38. ♂, ♀.

**tetramerum** Michener. North. Calif. Pollen: Unknown, but visits flowers of a yellow *Mimulus*.  
*Chelostoma tetramerum* Michener, 1942. Ent. News 53: 47. ♂.

### Genus CHELOSTOMOPSIS Cockerell

*Chelostomopsis* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 205.

Type-species: *Chelynia rubifloris* Cockerell. Orig. desig.

*Raphidostoma* Cockerell, 1936. Pan-Pacific Ent. 12: 133.

Type-species: *Chelynia rubifloris* Cockerell. Monotypic and orig. desig.  
(=*Raphidostoma ceanothi* Cockerell).

Revision: Michener, 1938. Ent. News 49: 127.

Taxonomy: Popov, 1961. Zool. Zhur. Akad. Nauk 40: 359-370, 3 figs. (tax. status, tax. relationships).

**rubifloris** (Cockerell). Wash., Oreg., Calif., Ariz. Ecology: Has been reared from cones of *Pinus attenuata*. Pollen: Polylectic, visits a wide variety of flowers including *Allium parvum*, *Agoseris*, *Arbutus menziesii*, *Arctostaphylos drupacea*, *A. mariposa*, *A. nevadensis*, *A. patula*, *Arenaria douglasii*, *Calochortus luteus*, *C. nudus*, *Castilleja*, *Ceanothus cuneatus*, *C. integerrimus*, *C. parviflorus*, *Cercocarpus ledifolius*, *Chamaebatia foliolosa*, *Chorizanthe staticoides*, *Clarkia unguiculata*, *Collinsia bicolor*, *Convolvulus occidentalis*, *Cryptantha denticulata*, *C. intermedia*, *C. lepida*, *Delphinium*, *Eriastrum*, *Eriodictyon californicum*, *Frasera californica*, *Fragaria californica*, *Gilia exilis*, *G. tricolor*, *Grindelia*, *Haplopappus linearifolius*, *Helianthus*, *Hesperochiron*, *Horkelia*, *Lepechinia*, *calycina*, *Limnanthes douglasii*, *Lotus argophyllus*, *L. corniculatus*, *L. davidsonii*, *L. glaber*, *L. scoparius*, *Lupinus bicolor*, *L. micranthus*, *L. nanus*, *Melilotus*, *Mimulus fremontii*, *M. primuloides*, *M. suksdorfii*, *Montia perfoliata*, *Nama parryi*, *Navarretia heterodoxa*, *Nemophila exilis*, *N. heterophylla*, *N. integrifolia*, *N. maculata*, *N. menziesii*, *Penstemon breviflorus*, *P. heterophyllus*, *Phacelia brachyloba*, *P. californica*, *P. davidsonii*, *P. heterophylla*, *Plagiobothrys nothofulvus*, *Plectritis ciliosa*, *Potentilla glandulosa*, *Prunus ilicifolia*, *P. subcordata*, *Radicula nasturtium-aquaticum*, *Ranunculus*, *Rhamnus californica*, *R. crocea*, *Rhus trilobata*, *Ribes roezlii*, *Salvia carnosa*, *S. columbariae*, *S. mellifera*, *Satureja douglasii*, *Sedum stenopetalum*, *Senecio*, *Stenotopsis linearifolius*, *Streptanthus tortuosus*, *Thysanocarpus curvipes*, *Trifolium gracilentum*, *T. melananthum*, *T. microcephalum*, *T. tridentatum*, *Verbena lasiostachys*, *V. prostrata*, *Viola pedunculata*, *V. purpurea*, *Wyethia*.  
*Chelynia rubifloris* Cockerell, 1898. Canad. Ent. 30: 50. ♀.  
*Chelostoma rubifloris edwardsii* Cockerell, 1916. Entomologist 49: 157. ♀.  
*Raphidostoma ceanothi* Cockerell, 1936. Pan-Pacific Ent. 12: 134. ♂.

### Genus PROTERIADES Titus

The bees of this genus appear to collect pollen almost exclusively from flowers of the boraginaceous genus *Cryptantha*. Some of the species make their nests in the ground while others construct them in preexisting holes in wood above ground.

Revision: Timberlake and Michener, 1950. Kans. Univ. Sci. Bul. 33: 387-440, 16 figs.

Taxonomy: Hurd and Michener, 1955. Calif. Ins. Survey, Bul. 3: 129-153, pls. 9, 21-22, figs. 92-111, maps 63-76 (Calif. spp.). — Michener and Sokal, 1957. Evolution 11: 158 (subgeneric assignments). — Rubin, 1966. Syst. Zool. 15: 176-182, tables 1-3 (phenetic classification). — Michener and Sokal, 1966. Ent. Soc. Amer., Ann. 59: 1211-1217, 5 figs. (phenetic similarities among the species of the *Hoplitis* complex).

### Genus PROTERIADES Subgenus CEPHALAPIS Cockerell

*Chelostoma* subg. *Cephalapis* Cockerell, 1910. Ann. and Mag. Nat. Hist. (8) 5: 23.

Type-species: *Chelostoma (Cephalapis) jacintanum* Cockerell. Monotypic and orig. desig.

**jacintana** (Cockerell). Calif., Oreg. Pollen: Oligolege of *Cryptantha* including *C. intermedia*, *C. micrantha*, *C. m. var. lepida*, *C. muricata* var. *denticulata*, but also visits flowers of *Ceanothus* and *Eriogonum* for nectar.

*Chelostoma jacintanum* Cockerell, 1910. Ann. and Mag. Nat. Hist. (8) 5: 23. ♂.

### Genus PROTERIADES Subgenus PROTERIADES Titus

*Proteriades* Titus, 1904. N. Y. Ent. Soc., Jour. 12: 25.

Type-species: *Heriades semirubra* Cockerell. Monotypic.

**basingeri** Timberlake and Michener. Calif. (Riverside). Pollen: *Cryptantha intermedia*.

*Proteriades basingeri* Timberlake and Michener, 1950. Kans. Univ. Sci. Bul. 33: 413. ♂, ♀.

**bidenticauda** Timberlake and Michener. Calif. (Inyo and Kern Cos.). Pollen: *Cryptantha* sp., but also visits flowers of *Mentzelia* presumably for nectar.

*Proteriades bidenticauda* Timberlake and Michener, 1950. Kans. Univ. Sci. Bul. 33: 420, figs. 4, 11. ♂, ♀.

**boharti** Timberlake and Michener. Calif. (Carrville, Trinity Co.).

*Proteriades boharti* Timberlake and Michener, 1950. Kans. Univ. Sci. Bul. 33: 429, figs. 2, 14. ♂.

**caudex** Timberlake and Michener. Calif. (San Jacinto Mts.). Pollen: Oligolege of *Cryptantha intermedia*, *C. lepida*, *C. micrantha*.

*Proteriades caudex* Timberlake and Michener, 1950. Kans. Univ. Sci. Bul. 33: 418, figs. 3, 15. ♂, ♀.

**cryptanthae** Timberlake and Michener. South. Calif. Pollen: *Cryptantha intermedia*.

*Proteriades cryptanthae* Timberlake and Michener, 1950. Kans. Univ. Sci. Bul. 33: 416. ♂, ♀.

**deserticola** Timberlake and Michener. South. Calif. Ecology: Nests in burrows in ground.

Pollen: *Cryptantha angustifolia*, *C. barbiger*.

*Proteriades deserticola* Timberlake and Michener, 1950. Kans. Univ. Sci. Bul. 33: 430. ♂, ♀.

**evansi** Michener. Calif. (Sierra Nevada Mts.). Pollen: *Cryptantha flaccida*.

*Proteriades evansi* Michener, 1936. South. Calif. Acad. Sci., Bul. 35: 92. ♀.

**hamulicornis** Timberlake and Michener. Calif. (Inyo Co.). Pollen: *Cryptantha* spp.

*Proteriades hamulicornis* Timberlake and Michener, 1950. Kans. Univ. Sci. Bul. 33: 425, figs. 5, 13. ♂, ♀.

**nanula nanula** Timberlake and Michener. South. Calif. lowlands. Pollen: *Cryptantha intermedia*.

*Proteriades nanula nanula* Timberlake and Michener, 1950. Kans. Univ. Sci. Bul. 33: 409. ♂, ♀.

**nanula sparsa** Timberlake and Michener. Centr. Calif., south. Calif. mts. Pollen: *Cryptantha angustifolia*, *C. flaccida*, *C. micrantha* var. *lepida*.

*Proteriades nanula sparsa* Timberlake and Michener, 1950. Kans. Univ. Sci. Bul. 33: 410. ♂, ♀.

**nigrella attonita** Michener. Calif. (Inyo Co.). Pollen: *Cryptantha racemosa*.

*Proteriades nigrella attonita* Michener, 1954. Kans. Ent. Soc., Jour. 27: 73. ♀, ♂.

**nigrella nigrella** Michener. South. Calif. Pollen: *Cryptantha angustifolia*.

*Proteriades nigrella nigrella* Michener, 1954. Kans. Ent. Soc., Jour. 27: 73. ♀.

**palmarum** (Cockerell). South. Calif. Pollen: *Cryptantha angustifolia*, *C. barbiger*.

*Osmia palmarum* Cockerell, 1935. Pan-Pacific Ent. 11: 48. ♀.

*Proteriades nigra* Timberlake and Michener, 1950. Kans. Univ. Sci. Bul. 33: 405. ♀.

Taxonomy: Michener, 1954. Kans. Ent. Soc., Jour. 27: 71. ♂. — Hurd and Michener, 1955.

Calif. Ins. Survey, Bul. 3: 139 (synonymy).

**pygmaea** Timberlake and Michener. South. Calif. Pollen: Oligolege of *Cryptantha* including *C. angustifolia*, *C. barbiger*, but also visits flowers of *Eriogonum* and *Nama demissum*.

*Proteriades pygmaea* Timberlake and Michener, 1950. Kans. Univ. Sci. Bul. 33: 411, figs. 6, 16. ♂, ♀.

**reducta** Timberlake and Michener. Calif. (Riverside Co.). Pollen: *Cryptantha intermedia*.

*Proteriades reducta* Timberlake and Michener, 1950. Kans. Univ. Sci. Bul. 33: 414. ♂, ♀.

- seminigra seminigra** Timberlake and Michener. South. Calif. Pollen: *Cryptantha intermedia*.  
*Proteriades seminigra seminigra* Timberlake and Michener, 1950. Kans. Univ. Sci. Bul. 33: 403. ♂, ♀.
- seminigra yosemitensis** Timberlake and Michener. Cent. Calif. Pollen: *Cryptantha* sp.  
*Proteriades seminigra yosemitensis* Timberlake and Michener, 1950. Kans. Univ. Sci. Bul. 33: 404. ♂, ♀.
- semirubra** (Cockerell). Coastal south. and cent. Calif. Pollen: *Cryptantha intermedia*, but also visits *Eriophyllum multicaule* for nectar.  
*Heriades semirubra* Cockerell, 1898. Amer. Ent. Soc., Trans. 25: 198. ♂.
- shoshone** Parker. Nev. (Elko County). Ecology: Nests in elderberry trap-stems. Parasite: *Stelis coarctatus* Cwfd. Pollen: Stores pollen of *Cryptantha*.  
*Proteriades shoshone* Parker, 1976. Pan-Pacific Ent. 52: 73, figs. 1-8. ♂, ♀.
- Biology: Parker, 1976. Pan-Pacific Ent. 52: 75-79, figs. 9-14 (nest, sex ratio, cocoon, supersedure, parasite).
- similis** Timberlake and Michener. South. Calif. Pollen: *Cryptantha intermedia*.  
*Proteriades similis* Timberlake and Michener, 1950. Kans. Univ. Sci. Bul. 33: 406. ♀.
- tristis** Michener. South. Calif. Pollen: *Cryptantha intermedia*, *C. micrantha*, *C. muricata*.  
*Proteriades tristis* Michener, 1936. South. Calif. Acad. Sci., Bul. 35: 92. ♀.
- truicauda** Timberlake and Michener. Calif. (San Jacinto Mts.). Pollen: *Cryptantha micrantha*.  
*Proteriades truicauda* Timberlake and Michener, 1950. Kans. Univ. Sci. Bul. 33: 423. ♂, ♀.

#### Genus PROTIERIADES Subgenus XEROSMIA Michener

- Anthocopa* subg. *Xerosmia* Michener, 1943 Ent. Soc. Amer., Ann. 36: 81.  
 Type-species: *Osmia xerophila* Cockerell. Orig. desig.
- xerophila** (Cockerell). South. Calif. Ecology: Reared from old nests of *Anthophora linsleyi* Timberlake dug from ground. Parasite: *Nemognatha scutellaris* Say. Pollen: Oligolege of *Cryptantha* including *C. barbiger*, but also visits flowers of *Larrea tridentata* and *Malva parviflora* for nectar. Predator: *Cymatodera*.  
*Osmia xerophila* Cockerell, 1935. Pan-Pacific Ent. 11: 45. ♀, ♂.
- Taxonomy: Michener, 1953. Kans. Univ. Sci. Bul. 35: 1055, figs. 146-148, 150 (larva).  
 Biology: Linsley and MacSwain, 1942. Amer. Midland Nat. 27: 408 (nest).

#### Genus PROTIERIADES Subgenus PENTERIADES Michener and Sokal

- Proteriades* subg. *Penteriades* Michener and Sokal, 1957. Evolution 11: 158.  
 Type-species: *Osmia remotula* Cockerell. Orig. desig.
- incanescens incanescens** (Cockerell). Ariz.  
*Hoplitina incanescens* Cockerell, 1922. Amer. Mus. Novitates 40: 7. ♀.
- incanescens nevadensis** Timberlake and Michener. S. Dak., Wyo., Nev., Calif. Pollen: *Cryptantha bradburiana*.  
*Proteriades incanescens nevadensis* Timberlake and Michener, 1950. Kans. Univ. Sci. Bul. 33: 399. ♀.
- Taxonomy: Michener, 1954. Kans. Ent. Soc. Jour. 27: 71. ♂. — LaBerge, 1973. Ent. News 84: 160. (geog. and floral recs.). — Tepedino, 1974. Ent. News 85: 146 (geogr. record).
- incanescens tota** Michener. Calif. (Tuolumne Co.).  
*Proteriades incanescens tota* Michener, 1954. Kans. Ent. Soc., Jour. 27: 72. ♀.
- remotula** (Cockerell). Calif. Ecology: Observed entering hole in the ground. Pollen: Oligolege of *Cryptantha* including *C. intermedia*, *C. micrantha*, but also visits flowers of *Asclepias* and *Eriophyllum confertiflorum* for nectar.  
*Osmia remotula* Cockerell, 1910. Canad. Ent. 42: 170. ♀.
- Taxonomy: Snelling, 1962. Pan-Pacific Ent. 38: 228-229 (geogr. and floral records).

#### Genus PROTIERIADES Subgenus HOPLITINA Cockerell

- Hoplitella* Cockerell, 1910. Canad. Ent. 42: 169. Preocc.



Type-species: *Ashmeadiella howardi* Cockerell. Monotypic. (= *Hoplitella pentamera* Cockerell).

*Hoplitina* Cockerell, 1913. Canad. Ent. 45: 34. Proposed to replace *Hoplitella* Cockerell.  
**bullifacies** (Michener). East. Calif., desert. Parasite: *Anthrax irroratus* Say, *Leucospis affinis* Say, *Sphaerophthalma* sp., *Stelis* sp. Pollen: Presumably *Cryptantha*, but is known to visit flowers of *Phacelia* including *P. aff. fremontii*. Predator: *Trichodes orlatus* Say.  
*Hoplitis* (*Hoplitina*) **bullifacies** Michener, 1947. Amer. Mus. Nat. Hist., Bul. 89: 274. ♀ (♂ misdet.).

Taxonomy: Michener, 1954. Pan-Pacific Ent. 30: 37-38. ♂, ♀.

**bunocephala** (Michener). Cent. Calif. Parasite: *Chrysura pacifica* (Say). Pollen: Unknown, but visits flowers of *Lotus* including *L. subpinnatus*.

*Hoplitis* (*Hoplitina*) **bunocephala** Michener, 1947. Amer. Mus. Nat. Hist., Bul. 89: 276. ♀, ♂.

**howardi** (Cockerell). South. and cent. Calif. Parasite: *Stelis* sp. Pollen: Unknown, but appears to visit principally the flowers of *Lotus* including *L. glaber*, *L. scoparius*, *L. strigosus*, but has also been taken at flowers of *Cryptantha intermedia*, *Eriophyllum confertiflorum*, and *Salvia*.

*Ashmeadiella howardi* Cockerell, 1910. Ann. and Mag. Nat. Hist. (8) 5: 22. ♀ (♂ misdet.).

*Hoplitella pentamera* Cockerell, 1910. Canad. Ent. 42: 169. ♂.

*Hoplitina hesperia* Crawford, 1916. Insecutor Inscitiae Menstruus 4: 103. ♀.

**linsdalei** (Michener). Cent. Calif.

*Hoplitis* (*Hoplitina*) **linsdalei** Michener, 1947. Amer. Mus. Nat. Hist., Bul. 89: 277. ♂.

**mazourka** (Michener). Calif. (Inyo Co.). Pollen: Unknown, but visits flowers of *Cryptantha*, *Gilia*, *Tetradymia*.

*Hoplitis mazourka* Michener, 1954. Pan-Pacific Ent. 30: 38. ♂.

**mojavensis** (Michener). South. Calif. Pollen: Unknown, but visits flowers of *Cryptantha barbiger*, *Lasthenia chrysostoma*, *Nama demissum*, *Phacelia fremontii*.

*Hoplitis* (*Hoplitina*) **mojavensis** Michener, 1947. Amer. Mus. Nat. Hist., Bul. 89: 275. ♀.

#### Genus PROTIERIADES Subgenus ACROSMIA Michener

*Hoplitis* subg. *Acrosmia* Michener, 1947. Amer. Mus. Nat. Hist., Bul. 89: 298.

Type-species: *Hoplitis plagiostoma* Michener. Orig. desig.

**laevibullata** (Michener). Calif., Utah. Pollen: Unknown, but visits flowers of *Calyptidium umbellatum*, *Nemophila*, *Phacelia*.

*Anthocopa* (*Eremosmia*) **laevibullata** Michener, 1943. Ent. Soc. Amer., Ann. 36: 68. ♀.

*Hoplitis* (*Acrosmia*) **perissocera** Michener, 1947. Amer. Mus. Nat. Hist., Bul. 89: 299. ♂.

Taxonomy: Michener, 1954. Pan-Pacific Ent. 30: 40 (synonymy).

**plagiostoma** (Michener). Calif. (Sierra Nevada Mts.), Oreg.

*Hoplitis* (*Acrosmia*) **plagiostoma** Michener, 1947. Amer. Mus. Nat. Hist., Bul. 89: 298. ♂.

**rufina** (Michener). Calif., Oreg., Utah. Pollen: Unknown, but visits flowers of *Nemophila*, *Viola purpurea*.

*Hoplitis rufina* Michener, 1954. Pan-Pacific Ent. 30: 40. ♀, ♂.

#### Genus HOPLITIS Klug

Revision: Michener, 1947. Amer. Mus. Nat. Hist., Bul. 89: 261-317 (N. Amer. spp. with references to biological works).

Taxonomy: Hurd and Michener, 1955. Calif. Ins. Survey, Bul. 3: 44-94, pls. 7, 14-18, figs. 5, 51-70, maps 17-39 (Calif. spp.). — Michener and Sokal, 1957. Evolution 11: 130-162 (phenetic classification of the *Hoplitis* complex). — Sokal and Michener, 1958. Kans. Univ. Sci. Bul. 38: 1409-1438 (systematic relationships within the *Hoplitis* complex). — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 56-68, figs. 19-25, table 3 (eastern U. S. spp.). — Michener, 1966. Entomologist 99: 146 (status of *Anthocopa* and *Hoplitis*). — Rubin, 1966. Syst. Zool. 15: 176-182, tables 1-3 (phenetic classification of the *Hoplitis* complex). — Michener and Sokal, 1966. Ent. Soc. Amer., Ann. 59: 1211-1217, 5 figs. (phenetic

similarities among the species of the *Hoplitis* complex). — Michener, 1968. Ent. South. Africa, Jour. 31: 337 (status of *Anthocopa* and *Hoplitis*).

#### Genus HOPLITIS Subgenus HOPLITIS Klug

*Hoplitis* Klug, 1807. Mag. Insektenk. 6: 225.

Type-species: *Apis adunca* Panzer. Monotypic.

*Osmia* subg. *Ctenosmia* Thomson, 1872. Hym. Scand., v. 2, p. 233.

Type-species: *Apis adunca* Panzer. Desig. by Michener, 1941.

**anthocopoides** (Schenck). N. Y. (Albany and adjacent counties); Europe. Ecology: Builds mortar and pebble nests on exposed rock surfaces. Adventive from Europe. Parasite: *Acroricus stylator* (Thunb.), *Anthrax irroratus* Say, *Chrysis coerulans* Fabr., *Melittobia chalybii* Ashm., *Monodontomerus montivagus* Ashm., *Stelis labiata* (Prov.). Pollen: Oligolectic on *Echium vulgare*, but in Europe also collects pollen from *Anchusa officinalis*.

*Osmia spinolae* Schenck, 1851. Nassau. Ver. f. Naturk. Jahrb. 7: 68. ♀. Preocc.

*Osmia anthocopoides* Schenck, 1853. Nassau. Ver. f. Naturk. Jahrb. 9: 181. N. name.

*Osmia caementaria* Gerstaecker, 1869. Stettin. Ent. Ztg. 30: 339. ♀, ♂.

Taxonomy: Eickwort, 1970. Psyche 77: 190-201, 11 figs. (synonymy, redescription, systematic position, distribution).

Biology: Eickwort, 1970. Psyche 77: 196-199 (floral relationships, summary of life history).

— Eickwort, 1973. Search, Cornell Univ. Agr. Expt. Sta. 3: 1-31, 55 figs., 3 tables (life history, nest architecture, immature stages, parasites). — Eickwort, 1975. Evolution 29: 142-150, 1 fig., 2 tables (gregarious nesting and evolution of parasitism and sociality among megachilid bees). — Eickwort, 1975. Ztschr. Tierpsychol. 3: 237-254, 8 figs, 1 table (nest-building behavior).

Morphology: Schmidt and Stockton, 1971. Ent. News 82: 275-277 (analysis of DNA in sperm).

#### Genus HOPLITIS Subgenus ANDRONICUS Cresson

*Andronicus* Cresson, 1864. Ent. Soc. Phila., Proc. 2: 384.

Type-species: *Andronicus cylindricus* Cresson. Monotypic.

**cylindrica** (Cresson). Que. and N. S. to Fla., west to N. W. T., B. C., Colo., Tex. Ecology: Nests in dry pithy stems including trap-nests. Parasite: *Melittobia chalybii* Ashm., *Stelis foederalis* Smith, *S. labiata* Prov., *S. lateralis* Cress., *Tricrania stansburyi* Hald. Pollen: Polylectic, visits flowers of many families, principally Leguminosae, Compositae, and Labiatae, including *Amorpha*, *Blephilia*, *Celastrus*, *Dianthera*, *Hydrophyllum*, *Lobelia*, *Petalostemon*, *Rubus*, *Senecio*, *Specularia*, *Trifolium*, *Verbena*, *Veronica*.

*Andronicus cylindricus* Cresson, 1864. Ent. Soc. Phila., Proc. 2: 384. ♂.

*Osmia spoliata* Provancher, 1888. Addit. Corr. Faune Ent. Canada, Hym., p. 327. ♀.

*Hoplitis monardae* Cockerell, 1914. Ann. and Mag. Nat. Hist. (8) 14: 363. ♀.

*Hoplitis hicksi* Cockerell, 1932. Brooklyn Ent. Soc., Bul. 27: 203. ♀.

Biology: Hicks, 1926. Colo. Univ. Studies 15: 217 (nest). — Fye, 1965. Canadian Ent. 97: 871-872, fig. 2 (life history, parasite). — Medler, 1967. Kans. Ent. Soc., Jour. 40: 137-140, fig. 1 (nest architecture, life history, parasites).

#### Genus HOPLITIS Subgenus MONUMETHA Cresson

*Monumetha* Cresson, 1864. Ent. Soc. Phila., Proc. 2: 387.

Type-species: *Chelostoma albifrons* Kirby. Desig. by Titus, 1904. (= *Monumetha argentifrons* Cresson).

*Chlorosmia* Sladen, 1916. Canad. Ent. 48: 270.

Type-species: *Osmia fulgida* Cresson. Monotypic.

Taxonomy: Michener, 1936. Amer. Mus. Novitates 875: 29 (key).

**albifrons albifrons** (Kirby). N. S., to N. Y., west to B. C., north to N. W. T. and Alaska.

Parasite: *Melittobia chalybii* Ashm., *Stelis submarginata* Cress. Pollen: Unknown, but visits flowers of *Phacelia*.

*Chelostoma albifrons* Kirby, 1837. In Richardson, Fauna Bor.-Amer., v. 4, p. 270. ♂.

*Monumetha borealis* Cresson, 1864. Ent. Soc. Phila., Proc. 2: 388. ♀.

*Monumetha obsoleta* Cresson, 1864. Ent. Soc. Phila., Proc. 2: 388. ♂.

*Megachile oblonga* Provancher, 1882. Nat. Canad. 13: 230. ♀.

Taxonomy: Michener, 1947. Evolution, 1: 172.

Biology: Fye, 1965. Canad. Ent. 97: 867-871, tables 2-4 (nest, nest architecture, parasite).

**albifrons argentifrons** (Cresson). Alta. south to N. Mex. and Ariz., east to Nebr. (Sioux Co.), west to B. C., Wash. and Oreg., thence south along Sierra Nev. in Calif. Pollen: Apparently polylectic, visits a wide variety of flowers including *Allium*, *Apocynum*, *Arctostaphylos nevadensis*, *Astragalus*, *Cirsium*, *Clarkia pulchella*, *C. unguiculata*, *C. williamsoni*, *C. xantiana*, *Cleome serrulata*, *Erigeron*, *Eriodictyon californicum*, *Geranium fremontii*, *Gilia*, *Gormaniana obtusata*, *Lotus*, *Mertensia franciscana*, *Mirabilis laevis*, *Nema rothrockii*, *Opulaster*, *Opuntia*, *Pedicularis groenlandica*, *Penstemon newberryi*, *Phacelia frigida*, *P. glandulosa*, *P. leucophylla*, *Phyllodoce breweri*, *Potentilla glandulosa*, *Rosa*, *Senecio*, *Spiraea sorbifolia*, *Streptanthus tortuosus*.  
*Monumetha argentifrons* Cresson, 1864. Ent. Soc. Phila., Proc. 2: 387. ♂.

Biology: MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 70: 51 (floral relationships).

**albifrons maura** (Cresson). Southwest. Oreg., Calif. (west of Sierra Nevada Mts.). Ecology: A female has been collected carrying a pulpy, green mass, apparently consisting of macerated leaf tissue. Parasite: *Stelis* sp., *Tricrania stansburyi* Hald. Pollen: Apparently polylectic, visits a wide variety of flowers including *Apocynum androsaemifolium*, *Brodiaea lutea*, *Chamaebatia foliolosa*, *Clarkia biloba*, *C. breweri*, *C. concinna*, *C. cylindrica*, *C. dudleyana*, *C. elegans*, *C. gracilis albicaulis*, *C. rhomboidea*, *C. rubicunda*, *C. speciosa nitens*, *C. unguiculata*, *Cirsium*, *Convolvulus*, *Cordylanthus pilosus*, *Cryptantha intermedia*, *Eriodictyon trichocalyx*, *Eriogonum*, *Gilia capitata*, *Gormaniana obtusata*, *Iris missouriensis*, *Helianthella californica*, *Lotus davidsonii*, *L. scoparius*, *Lonicera interrupta*, *Mimulus*, *Mirabilis laevis*, *Nemophila integrifolia*, *N. menziesii*, *Penstemon*, *Phacelia californica*, *P. distans*, *P. heterophylla*, *P. ramosissima*, *Phyllodoce breweri*, *Ranunculus*, *Stanleya pinnata*.

*Osmia maura* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 104. ♀.

*Andronicus hesperius* Cockerell, 1903. South. Calif. Acad. Sci., Bul. 2: 35. ♂.

Biology: MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 70: 51 (floral relationships).

**fulgida fulgida** (Cresson). Alaska and Yukon, south to Oreg., Ariz. and N. Mex. Ecology: Nests in abandoned beetle burrows in wood of various sorts. Parasite: *Aritranis imitator ruficauda* Townes, *Melittobia* sp., *Sapyga aculeata* Cress., *Sphaerophthalma* sp., *Stelis monticola* Cress., *Stelis* sp., *Tricrania stansburyi* Hald. Pollen: Apparently polylectic, visits flowers of *Allium diehlii*, *Clarkia pulchella*, *Convolvulus*, *Fragaria vesca*, *Gentiana parryi*, *Geranium caespitosum*, *Phacelia leucophylla*, *P. linearis*, *Potentilla*, *Prunus melanocarpa*, *Ranunculus*, *Rosa*, *Rubus deliciosus*. Predator: *Trichodes ornatus* Say.

*Osmia fulgida* Cresson, 1864. Ent. Soc. Phila., Proc. 3: 34. ♀.

*Osmia viridis* Cresson, 1864. Ent. Soc. Phila., Proc. 3: 35. ♀.

Biology: Clement and Rust, 1976. Pan-Pacific Ent. 52: 114-116, figs. 3, 4, tables 1, 2 (nest architecture, cell provisions, development, parasites).

**fulgida platyura** (Cockerell). South. Oreg., Calif. Parasite: *Anthrax irroratus* Say, *Leucospis affinis* Say, *Sapyga aculeata* Cress. Pollen: Apparently polylectic, visits flowers of *Allium parvum*, *Astragalus douglasii*, *Calochortus nudus*, *Centromadia*, *Chamaebatia foliolosa*, *Clarkia cylindrica*, *C. dudleyana*, *C. purpurea quadrivulnera*, *C. rhomboidea*, *C. unguiculata*, *Chaenactis glabriuscula*, *Collinsia heterophylla*, *C. tinctoria*, *C. torreyi wrightii*, *Cryptantha intermedia*, *Eriodictyon californicum*, *E. crassifolium*, *Fragaria*

*californica*, *Gilia capitata*, *Haplopappus linearifolius*, *Hemizonia*, *Hesperochiron californicus*, *Lappula*, *Lotus subpinnatus*, *Lupinus bicolor*, *L. formosus*, *L. nanus*, *Marrubium vulgare*, *Meentzelia albicaulis*, *Mimulus*, *Nemophila integrifolia*, *N. maculata*, *N. menziesii*, *Phacelia alba*, *P. ciliata*, *P. davidsonii*, *P. distans*, *P. frigida*, *P. heterophylla*, *P. ramosissima*, *P. tanacetifolia*, *Potentilla glandulosa*, *Rhus trilobata*, *Salix*, *Sidalcea malvaeflora*, *Sphaeralcea fasciculatum*, *Stachys californica*, *Taraxacum*, *Thysanocarpus curvipes*, *Trichostema parishii*, *Trifolium*.

*Osmia platyura* Cockerell, 1911. Ann. and Mag. Nat. Hist. (8) 8: 765. ♂, ♀.

*Osmia lawae* Michener, 1936. Amer. Mus. Novitates 875: 29. ♂, ♀.

Biology: Clement and Rust, 1976. Pan-Pacific Ent. 52: 114-116, figs 3, 4, tables 1, 2 (nest architecture, cell provisions, development)

***louisiae*** (Cockerell). B. C., Wash., Oreg., Idaho, north. Calif. and Utah.

*Osmia louisiae* Cockerell, 1934. Amer. Mus. Novitates 679: 14. ♀.

***viridimicans*** (Cockerell). Wash., west Oreg., Calif. (Sierra Nevada Mts.).

*Osmia viridimicans* Cockerell, 1897. Acad. Nat. Sci. Phila., Proc. 49: 334. ♀.

### Genus HOPLITIS Subgenus DASYOSMIA Michener

*Hoplitis* subg. *Dasyosmia* Michener, 1947. Amer. Mus. Nat. Hist., Bul. 89: 294.

Type-species: *Alcidamea biscutellae* Cockerell. Orig. desig.

***biscutellae*** (Cockerell). Tex., N. Mex., Ariz., Utah, Nev., south. Calif.; deserts. Ecology: Nest has been observed in a bank. Parasite: *Anthrax irroratus* Say, *Nemognatha macswaini* Enns, *N. nigripennis* LeC., *Stelis* sp. Pollen: Oligolege of *Larrea tridentata*, but also visits other flowers for nectar including *Aster abatus*, *Encelia farinosa*, *Geraea canescens*, *Helianthus niveus*, *Hyptis emoryi*, *Prosopis*, *Salvia*, *Sphaeralcea*, *ambigua*, *Stenotopsis linearifolius*. Predator: *Cymatodera* sp., *Trichodes ornatus* Say.

*Alcidamea biscutellae* Cockerell, 1897. Ann. and Mag., Nat. Hist. (6) 19: 400. ♂.

Biology: Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 36, tables 2, 5, 7, 9, 11-15 (floral relationship with *Larrea*).

***paroselae*** Michener. East. Calif., desert. Pollen: Unknown, but visits flowers of *Dalea fremontii*, *D. polyadenia*.

*Hoplitis* (*Dasyosmia*) *paroselae* Michener, 1947. Amer. Mus. Nat. Hist., Bul. 89: 296. ♂, ♀.

### Genus HOPLITIS Subgenus CYRTOSMIA Michener

*Hoplitis* subg. *Cyrtosmia* Michener, 1947. Amer. Mus. Nat. Hist., Bul. 89: 292.

Type-species: *Osmia hypocrita* Cockerell. Orig. desig. and monotypic.

***hypocrita*** (Cockerell). B. C. to Calif., Nev., Utah., Colo. and Ariz. Ecology: Nests in dead dry stems and also trap-nests of various sorts. Parasite: *Aritranis imitator ruficauda* Townes, *Eurytoma* sp., *Nemognatha scutellaris* LeC., *Sapyga aculeata* Cress., *Stelis sexmaculata* Ashm., *Stelis* sp., *Tricrania stansburyi* Hald. Pollen: Polylectic, visits a wide variety of flowers including *Amsinckia douglasiana*, *Astragalus antisellii*, *A. goniatus*, *A. pomonensis*, *A. parishii*, *A. tener*, *Brodiaea capitata*, *Brassica campestris*, *Eriodictyon californicum*, *Grindelia*, *Lathyrus*, *Lotus crassifolius*, *L. glaber*, *L. scoparius*, *Lupinus Paynei*, *Medicago sativa*, *Penstemon leonardi*, *Salix*, *Salvia carnosa*, *Sambucus*, *Stanleya pinnata*, *Trifolium*, *Vicia*.

*Osmia hypocrita* Cockerell, 1906. Canad. Ent. 38: 160. ♀.

Biology: Hicks, 1926. Colo. Univ. Studies 15: 217 (nest). —Clement and Rust, 1976.

Pan-Pacific Ent. 52: 111-114, figs. 1, 2, tables 1, 2 (nest architecture, cell provisions, development, parasite)

### Genus HOPLITIS Subgenus ALCIDAMEA Cresson

*Alcidamea* Cresson, 1864. Ent. Soc. Phila., Proc. 2: 385.

Type-species: *Alcidamea producta* Cresson. Desig. by Michener, 1941.

*Autochelostoma* Sladen, 1916. Canad. Ent. 48: 270.

Type-species: *Alcidamea producta* Cresson. Monotypic. (= *Autochelostoma canadensis* Sladen).

The species of this subgenus, whose habits are known, nest in the pithy cores of dead stems or canes of various plants.

**Taxonomy:** Michener, 1953. Kans. Univ. Sci. Bul. 35: 1051, figs. 142-145, 149 (larva).

**brachyodonta** (Cockerell). South. Calif. Ecology: Uses plant material sometimes supplemented with pebbles in nest construction. Parasite: *Stelis sexmaculata* Ashm. Pollen: Unknown, but visits flowers of *Chaenactis glabriuscula*, *Heliotropium curassavicum*.

*Alicidamea brachyodonta* Cockerell, 1933. Ent. News 44: 205. ♂.

**colei** (Crawford). South. Nev., south. Calif. Parasite: *Nemognatha scutellaris* LeC., *Stelis sexmaculata* Ashm. Pollen: Possibly an oligolege of *Eriodictyon* including *E. californicum*, *E. crassifolium*, *E. trichocalyx*, but also visits other flowers including *Collinsia tinctoria*, *Eriastrum virgatum*, *Lotus*, *Nama demissum*.

*Alicidamea colei* Crawford, 1916. Ent. Soc. Wash., Proc. 18: 127. ♂.

**elongaticeps** Michener. Calif. (Mojave and east. deserts). Pollen: Unknown, but visits flowers of *Dalea fremontii*, *Mimulus*.

*Hoplitis (Alicidamea) elongaticeps* Michener, 1947. Amer. Mus. Nat. Hist., Bul. 89: 290. ♀, ♂.

**grinnelli grinnelli** (Cockerell). Ariz., Calif., north. Mexico (Baja California and Sonora).

Parasite: *Nemognatha scutellaris* LeC., *Stelis sexmaculata* Ashm. Pollen: Polylectic, visits a wide variety of flowers including *Amsinckia intermedia*, *Astragalus fremontii*, *Ceanothus*, *Chaenactis*, *Chorizanthe staticoides*, *Collinsia torreyi*, *Cryptantha intermedia*, *C. racemosa*, *Dalea fremontii*, *Eriastrum virgatum*, *Erigeron stenophyllus*, *Eriogonum fasciculatum*, *Eucnide urens*, *Larrea tridentata*, *Lotus glaber*, *L. scoparius*, *L. strigosus*, *L. subpinnatus*, *Lupinus concinnus*, *Marrubium vulgare*, *Melilotus indica*, *Mentzelia*, *Mesembryanthemum edule*, *Mimulus*, *Phacelia distans*, *P. platyloba*, *P. ramosissima*, *Prosopis pubescens*, *Rhamnus crocea*, *Salvia mellifera*, *Sphaeralcea ambigua*, *Trifolium*.

*Hoplitis grinnelli* Cockerell, 1910. Ann. and Mag. Nat. Hist. (8) 5: 22. ♀.

**grinnelli septentrionalis** Michener. B. C., Wash., Oreg., Idaho, Utah. Pollen: Unknown, but visits flowers of *Linum*, *Penstemon cyananthus*, *Phacelia linearis*.

*Hoplitis grinnelli septentrionalis* Michener, 1947. Amer. Mus. Nat. Hist., Bul. 89: 291. ♂, ♀.

**pilosifrons** (Cresson). Que. and Mass. to Fla., west to Alta., Colo., and Tex. Ecology: Excavates pith in dead stem of *Helianthus tuberosus* for nest. Parasite: *Stelis labiata* Cress., *S. lateralis* (Prov.). Pollen: Stores pollen of *Amorpha fruticosa* and *Melilotus officinalis*, but also visits other flowers for nectar and or pollen including *Barbarea*, *Blephilia*, *Cardamine*, *Chrysanthemum*, *Coreopsis*, *Desmodium*, *Dianthera*, *Erigeron*, *Geranium*, *Gillenia*, *Heracleum*, *Houstonia*, *Hydrophyllum*, *Krigia*, *Lepachys*, *Linaria*, *Lobelia*, *Lythrum*, *Malva*, *Nepeta*, *Oenothera*, *Oxalis*, *Pedicularis*, *Penstemon*, *Petalostemon*, *Polymonium*, *Potentilla*, *Psoralea*, *Pycnanthemum*, *Radicula*, *Rubus*, *Scutellaria*, *Senecio*, *Specularia*, *Stachys*, *Taenidia*, *Tephrosia*, *Teucrium*, *Trifolium*, *Verbena*, *Veronica*, *Vicia*, *Zizia*.

*Alicidamea pilosifrons* Cresson, 1864. Ent. Soc. Phila., Proc. 2: 386. ♂.

*Hoplitis gracieae* Cockerell, 1923. Ann. and Mag. Nat. Hist. (9) 11: 263. ♀.

*Alicidamea mucronata* Cockerell, 1934. Brooklyn Ent. Soc., Bul. 29: 18. ♂.

**Biology:** Michener, 1955. Kans. Ent. Soc., Jour. 28: 81-83 (nest, life history, parasite).

**producta bernardina** Michener. South. Calif. Mts. (overlapping range of *producta gracilis*).

Pollen: Apparently polylectic, visits a wide variety of flowers including *Astragalus parishii*, *Collinsia*, *Convolvulus*, *Dicentra chrysantha*, *Gilia exilis*, *Helianthus*, *Hesperochiron*, *Lotus scoparius*, *Mesembryanthemum crystallinum*, *Mimulus fremontii*, *Penstemon cordifolius*, *P. grinnelli*, *P. heterophyllus*, *P. spectabilis*, *Phacelia*.

*Hoplitis producta bernardina* Michener, 1947. Amer. Mus. Nat. Hist., Bul. 89: 287. ♂, ♀.

**producta gracilis** (Michener). Oreg., Calif. Nev. Ecology: Nests in dead, pithy stems and trap-nests of various sorts. Parasite: *Aprostocetus* sp., *Chrysura sonorensis* (Cam.), *Eurytoma stigmii* Ashm., *Sapyga aculeata* Cress., *Stelis sexmaculata* Ashm. Pollen: Apparently polylectic, visits a wide variety of flowers including *Allium parvum*, *Aster*

*foliaceus*, *Astragalus bolanderi*, *Brodiaea capitata*, *Calyptidium umbellatum*, *Carduus tenuiflorus*, *Castilleja*, *Chamaebatia foliolosa*, *Cirsium vulgare*, *Clarkia amoena*, *C. biloba*, *C. dudleyana*, *C. elegans*, *C. gracilis albicaulis*, *C. purpurea*, *C. rhomboidea*, *C. unguiculata*, *C. williamsonii*, *Collinsia parviflora*, *C. tinctoria*, *C. torreyi*, *Convolvulus*, *Cryptantha*, *Dudleya*, *Hugelia brauntonii*, *Eriodictyon californicum*, *E. trichocalyx*, *Gayophytum diffusum*, *Gilia exilis*, *Glycyrrhiza lepidota*, *Gormania obtusata*, *Hesperochiron*, *Heterogaura heterandra*, *Kelloggia galioides*, *Lepechinia calycina*, *Lessingia germanorum*, *Lotus argophyllus*, *L. corniculatus*, *L. davidsonii*, *L. nevadensis*, *L. scoparius*, *Lupinus breweri*, *Mimulus*, *Monardella villosa*, *Navarretia heterodoxa*, *Nemophila*, *Penstemon heterodoxus*, *P. newberryi*, *P. spectabilis*, *Phacelia davidsonii*, *P. distans*, *P. linearis*, *Potentilla glandulosa*, *Ranunculus californicus*, *Rosa*, *Rubus leucodermis*, *Salix*, *Satureja douglasii*, *Sidalcea calycosa*, *Trifolium gracilentum*, *T. variegatum*, *Verbena lasiostachys*, *Vicia americana*.  
*Osmia gracilis* Michener, 1935. Pan-Pacific Ent. 11: 183. ♀.

Biology: MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 70: 51 (floral relationships).

**producta interior** Michener. Alta., Wyo., Colo., Utah, N. Mex., Ariz. (west of plains). Pollen: Apparently polylectic, visits flowers of *Achillea millefolium*, *Astragalus*, *Helianthus peltolaris*, *Monarda pectinata*, *Penstemon angustifolium*, *Phacelia linearis*.

*Hoplitis producta interior* Michener, 1947. Amer. Mus. Nat. Hist., Bul. 89: 286. ♂, ♀.

**producta panamintana** Michener. Calif. (Panamint and nearby mts.). Pollen: Unknown, but visits flowers of *Phacelia*.

*Hoplitis producta panamintana* Michener, 1947. Amer. Mus. Nat. Hist., Bul. 89: 287. ♂.

**producta producta** (Cresson). Que. to Ga., west to Alta., Colo., and Tex. Ecology: Nests in sumac borings. Parasite: *Anthrax irroratus* Say, *Leucospis affinis* Say, *Nemognatha nigripennis* LeC., *N. scutellaris* LeC., *Sapyga aculeata* Cress., *Stelis crassiceps* Ckll., *S. labiata* (Prov.), *S. lateralis* Cress., *S. sexmaculata* Ashm., *Tricrania stansburyi* Hald.

Pollen: Polylectic, visits a wide variety of flowers including *Amorpha fruticosa*, *Apocynum*, *Astragalus*, *Azalea*, *Baptisia*, *Barbarea*, *Chrysanthemum*, *Crataegus*, *Erigeron philadelphicus*, *Geranium maculatum*, *Gilia*, *Lesquerella*, *Medicago sativa*, *Melilotus officinalis*, *Mentha canadensis*, *Penstemon hirsutus*, *Phacelia dubia*, *Potentilla*, *Rubus argutus*, *Salix*, *Solidago*, *Tephrosia virginiana*, *Trifolium*. Predator: *Philanthus pulcher* Dalla Torre.

*Aleidamea producta* Cresson, 1864. Ent. Soc. Phila., Proc. 2: 386. ♂.

*Autochelostoma canadensis* Sladen, 1916. Canad. Ent. 48: 270. "♂" = intersex.

*Aleidamea helenae* Cockerell, 1934. Amer. Mus. Novitates 732: 6. ♂.

Biology: Graenicher, 1905. Wis. Nat. Hist. Soc., Bul. 3: 153 (nest). —Comstock, 1924.

Introduction to entomology, p. 824 (nest). —Hicks, 1926. Colo. Univ. Studies 15: 217 (nest).

—Rau, 1928. Psyche 35: 100-107, 1 fig. (nest, life history). —Medler, 1961. Canad. Ent. 93: 571-573 (nest, life history).

**producta subgracilis** Michener. B. C., Wash., Oreg., Idaho.

*Hoplitis producta subgracilis* Michener, 1947. Amer. Mus. Nat. Hist., Bul. 89: 286. ♂, ♀.

**sambuci** Titus. B. C. to Calif., Nev. and Utah. Ecology: Nests in dry, pithy stems and trap-nests of various sorts. Parasite: *Gasteruption kirbyi* russeum Townes, *Nemognatha nigripennis* LeC., *N. scutellaris* LeC., *Sapyga aculeata* Cress., *Sphaerophthalma* sp., *Stelis* sp. Pollen: Apparently polylectic, visits a wide variety of flowers including *Amorpha fruticosa*, *Asclepias eriocarpa*, *Astragalus antisellii*, *Cirsium*, *Clarkia unguiculata*, *Cryptantha*, *Dicentra chrysantha*, *Eriodictyon californicum*, *E. crassifolium*, *Eriogonum*, *Helianthus*, *Hesperochiron*, *Layia glandulosa*, *Lonicera interrupta*, *Lotus glaber*, *L. scoparius*, *Lupinus formosus*, *L. hallii*, *L. paynei*, *Medicago sativa*, *Mimulus guttatus*, *Nama parryi*, *Penstemon spectabilis*, *Phacelia*, *Potentilla glandulosa*, *Rhamnus californica*, *Rubus leucodermis*, *Salvia mellifera*, *Sambucus glauca*, *Stanleya pinnata*, *Trichostema ovatum*, *Vicia americana*.

*Hoplitis sambuci* Titus, 1904. Ent. Soc. Wash., Proc. 6: 101. ♀, ♂.

Biology: Clement and Rust, 1976. Pan-Pacific Ent. 52: 116-117, fig. 5, tables 1, 2 (nest architecture, cell provisions, development, parasite).

**truncata mescalerium** Cockerell. Colo., N. Mex., Ariz. Pollen: Unknown, but visits flowers of *Gilia*.

*Hoplitis mescalerium* Cockerell, 1910. Entomologist 43: 90. ♀.

**truncata truncata** (Cresson). Que. and Maine to Fla., west to N. Dak., Wyo., Colo. and Miss.

Parasite: *Sappya centrata* Say. Pollen: Apparently polylectic, visits a wide variety of flowers including *Baptisia*, *Berlandiera*, *Ceanothus*, *Cleome*, *Convolvulus*, *Erigeron*, *Gillenia*, *Ilex*, *Melilotus*, *Oenothera*, *Penstemon*, *Pogonia graminifolia*, *Rubus*, *Tephrosia virginiana*, *Trifolium*, *Vaccinium*, *Vicia*.

*Alcidamea truncata* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 108. ♂.

**uvulalis** (Cockerell). Calif., Oreg., Idaho, Utah. Parasite: *Nemognatha scutellaris* LeC. Pollen: Unknown, but visits flowers of *Castilleja*, *Senecio*.

*Alcidamea uvulalis* Cockerell, 1902. South. Calif. Acad. Sci., Bul. 1: 139. ♂.

### Genus HOPLITIS Subgenus FORMICAPIS Sladen

*Formicapis* Sladen, 1916. Canad. Ent. 48: 271.

Type-species: *Formicapis clypeata* Sladen. Monotypic.

Revision: Michener, 1938. Ent. News 49: 129 (as *clypeata*).

**robusta** (Nylander). Holarctic, Alaska, N. W. T., Que., B. C., Alta., Sask., Mont. Wyo., Colo., Oreg., Calif.; Europe and Asia. Pollen: Apparently polylectic, evidently stores pollen of *Astragalus*, *Silene rupestris*, *Taraxacum*, *Trifolium*. Predator: *Phanthus pulcher* Dalla Torre.

*Heriades robusta* Nylander, 1848. Notis. Saellsk. Faun. Flor. Fenn. Forh. 1: 270. ♀, ♂.

*Osmia rhinoceros* Giraud, 1861. Zool.-Bot. Gesell. Wien, Verh. 11: 464. ♀.

*Formicapis clypeata* Sladen, 1916. Canad. Ent. 48: 271. ♀.

Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 57-58, figs. 19-20

(redescription). —Peters, 1970. Senckenb. Biol. 51: 193-197 (synonymy, distribution, floral relationships).

Biology: Clement and Rust, 1975. Ent. News 86: 115-120, 2 figs. (nest, cocoon, supersedure, floral relationships).

### Genus HOPLITIS Subgenus ROBERTSONELLA Titus

*Robertsonella* Titus, 1904. N. Y. Ent. Soc., Jour. 12: 22.

Type-species: *Robertsonella gleasoni* Titus Monotypic and orig. desig.

Revision: Michener, 1938. Ent. News 49: 130.

Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 64-68, fig. 25, table 3 (eastern U. S. spp.).

**gleasoni** (Titus). Tex. to Ill. and N. J. Pollen: Unknown, but visits flowers of *Geranium*, *Phacelia*, *Rubus*.

*Robertsonella gleasoni* Titus, 1904. N. Y. Ent. Soc., Jour. 12: 23. ♀, ♂.

*Robertsonella crataegina* Cockerell, 1909. Ann. and Mag. Nat. Hist. (8) 4: 28. ♂.

**micheneri** Mitchell. Kans., Ga. Pollen: Unknown, but visits flowers of *Amorpha fruticosa*.

*Hoplitis (Robertsonella) micheneri* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 64, fig. 25. ♀, ♂.

**simplex** (Cresson). Tex. to Conn. Parasite: *Stelis labiata* (Prov.). Pollen: Unknown, but visits flowers of *Phacelia*, *Salix*.

*Heriades simplex* Cresson, 1864. Ent. Soc. Phila., Proc. 2: 384. ♀.

### Genus HOPLITIS Subgenus Unassigned

**alboscopata** (Provancher). Que.

*Heriades alboscopatum* Provancher, 1888. Addit. Corr. Faune Ent. Canada, Hym., p. 425. ♀.

Taxonomy: Titus, 1906. Ent. Soc. Wash., Proc. 7: 160.

*imperfecta* (Provancher). Calif.

*Monumetha imperfecta* Provancher, 1896. Nat. Canad. 23: 9. ♀. Perhaps a *Megachile*.

### Genus ANTHOCOPA Lepeletier

This rather large genus of chiefly Holarctic bees occurs in Eurasia, Africa and in western North America, west of the Great Plains. Although there is some evidence which indicates that *Anthocopa* should be merged with *Hoplitis*, these taxa are maintained as distinct in this catalog.

Revision: Michener, 1943. Ent. Soc. Amer., Ann. 36: 49-86 (Nearctic spp.).

Taxonomy: Hurd and Michener, 1955. Calif. Ins. Survey, Bul. 3: 94-126, pls. 8, 19-20, figs. 71-91, maps 40-61 (Calif. spp.). — Michener and Sokal, 1957. Evolution 11: 130-162 (phenetic classification of the *Hoplitis* complex). — Sokal and Michener, 1958. Kans. Univ. Sci. Bul. 38: 1409-1438 (systematic relationships within the *Hoplitis* complex). — Michener, 1966. Entomologist 99: 146 (status of *Anthocopa* and *Hoplitis*). — Rubin, 1966. Syst. Zool. 15: 176-182, tables 1-3 (phenetic classification of the *Hoplitis* complex). — Michener and Sokal, 1966. Ent. Soc. Amer., Ann. 59: 1211-1217, 5 figs. (phenetic similarities among the species of the *Hoplitis* complex). — Michener, 1968. Ent. South Africa, Jour. 31: 337 (status of *Anthocopa* and *Hoplitis*).

### Genus ANTHOCOPA Subgenus ANTHOCOPA Lepeletier

*Anthocopa* Lepeletier, 1825. Encycl. Meth., Dict. Ins., v. 10, p. 314.

Type-species: *Apis papaveris* Latreille. Monotypic.

*Phyllotoma* Dumeril, 1860. Acad. Sci. Inst. France, Mem. 31: 842. Preocc.

Type-species: *Apis papaveris* Latreille. Desig. by Michener, 1941.

*Pseudosmia* Radoszkowski, 1872. Soc. Ent. Rossica, Horae 8: xviii. Republished by Radoszkowski, 1874. Soc. Imp. Nat. Moscou, Bul. 48 (1): 152.

Type-species: *Megachile cristata* Fonscolombe. Desig. by Cockerell, 1922.

*Pseudo-osmia* Radoszkowski, 1873. Soc. Imp. Nat. Moscou, Bul. 46 (2): 137. Emend.

*Pseudocosmia* Radoszkowski, 1886. Soc. Ent. Rossica, Horae 20: 14. Emend.

This subgenus does not occur in the New World.

### Genus ANTHOCOPA Subgenus ATOPOSMIA Cockerell

*Osmia* subg. *Atoposmia* Cockerell, 1935. Pan-Pacific Ent. 11: 50.

Type-species: *Osmia triodonta* Cockerell. Orig. desig.

All species visit chiefly flowers of *Penstemon* in the mountains.

*abjecta abjecta* (Cresson). Calif. (White Mts.), Oreg., Utah, Wyo., Colo. Ecology: Nests under stones. Pollen: Oligolege of *Penstemon*, including *P. alpinus*, *P. heterodoxus*, *P. moffatti*, *P. newberryi*.

*Osmia abjecta* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 103. ♀.

*Hoplitis mesae* Cockerell, 1930. Amer. Mus. Novitates 397: 2. ♂.

*Anthocopa* (*Atoposmia*) *nigrior* Michener, 1943. Ent. Soc. Amer., Ann. 36: 54. ♀ (♂ misdet.).

Taxonomy: Michener, 1954. Pan-Pacific Ent. 30: 43 (synonymy).

Biology: Parker, 1975. Pan-Pacific Ent. 51: 119-121, table 1 (nest, cocoon, sex ratio).

*abjecta alta* (Michener). Calif. (Sierra Nevada Mts.).

*Osmia alta* Michener, 1936. Canad. Ent. 68: 41. ♀.

*anthodyta anthodyta* Michener. Calif., Nev., Oreg., Idaho; Mexico (Baja California). Pollen: Oligolege of *Penstemon* including *P. cinereus*, *P. grinnellii*, *P. newberryi*, *P. palmeri*, but also visits flowers of *Collinsia parviflora*.

*Anthocopa* (*Atoposmia*) *anthodyta* Michener, 1943. Ent. Soc. Amer., Ann. 36: 60. ♀, ♂.

*anthodyta bequaerti* Michener. Ariz. (Santa Rita Mts.). Pollen: *Penstemon*.

*Anthocopa anthodyta bequaerti* Michener, 1954. Pan-Pacific Ent. 30: 42. ♂, ♀.

*arizonensis* Michener. Ariz.

*Anthocopa arizonensis* Michener, 1954. Pan-Pacific Ent. 30: 43. ♀.



**elongata** (Michener). Calif., Oreg., Wash., Mont., Colo. Pollen: Oligolege of *Penstemon* including *P. heterodoxus*, *P. newberryi*, but also visits flowers of *Phacelia*, *Potentilla* presumably for nectar.

*Osmia elongata* Michener, 1936. Canad. Ent. 68: 41. ♀.

**hebitis** Michener. Calif. (Sierra Nevada Mts.). Pollen: Presumably an oligolege of *Penstemon*, but also visits flowers of *Mimulus*.

*Anthocopa hebitis* Michener, 1954. Pan-Pacific Ent. 30: 44. ♀, ♂.

Taxonomy: Snelling, 1962. Pan-Pacific Ent. 38: 228 (geogr. and floral records).

**oregona** Michener. Calif. (Sierra Nevada Mts.), Oreg.

*Anthocopa (Atoposmia) oregona* Michener, 1943. Ent. Soc. Amer., Ann. 36: 53. ♀, ♂.

**panamintensis** Michener. Calif. (Panamint Mts.).

*Anthocopa (Atoposmia) panamintensis* Michener, 1943. Ent. Soc. Amer., Ann. 36: 65. ♀, ♂.

**pynognatha pynognatha** Michener. East. Calif. Pollen: Oligolege of *Penstemon* including *P. breviflorus*.

*Anthocopa (Atoposmia) pynognatha* Michener, 1943. Ent. Soc. Amer., Ann. 36: 64. ♀, ♂.

**pynognatha solata** Michener. Calif. Pollen: Oligolege of *Penstemon* including *P.*

*antirrhinoides*, *P. spectabilis*, but also visits flowers of *Euphorbia albomarginata*, *Salvia columbariae* presumably for nectar.

*Anthocopa (Atoposmia) pynognatha solatus* Michener, 1949. Kans. Ent. Soc., Jour. 22: 48. ♀, ♂.

Taxonomy: Snelling, 1962. Pan-Pacific Ent. 38: 228 (geogr. and floral records).

**triadonta shastensis** (Cockerell). Calif. (Sierra Nevada Mts.), Nev., Oreg. Pollen: Oligolege of *Penstemon* including *P. cinereus*.

*Osmia shastensis* Cockerell, 1935. Pan-Pacific Ent. 11: 46. ♀.

**triadonta triadonta** (Cockerell). Calif. (Mt. Diablo, Sierra Nevada and White Mts.). Pollen: Oligolege of *Penstemon* including *P. heterophyllus*.

*Osmia (Atoposmia) triadonta* Cockerell, 1935. Pan-Pacific Ent. 11: 50. ♂, ♀.

**triadonta usingeri** Michener. South. Calif. Pollen: Oligolege of *Penstemon* including *P. grinnellii*, *P. labrosus*, *P. spectabilis*, but also visits other flowers presumably for nectar including *Nama parryi*.

*Anthocopa triadonta usingeri* Michener, 1943. Ent. Soc. Amer., Ann. 36: 63. ♂, ♀.

### Genus ANTHOCOPA Subgenus HEXOSMIA Michener

*Anthocopa* subg. *Hexosmia* Michener, 1943. Ent. Soc. Amer., Ann. 36: 74.

Type-species: *Osmia copelandica* Cockerell. Orig. design.

**copelandica albomarginata** (Cockerell). Calif. west. Oreg. Parasite: *Chrysura sonorensis*

Cam., *Epistenia* sp., *Nemognatha scutellaris* LeC., *Sapyga pumila* Cress. Pollen: Apparently an oligolege of *Phacelia* including *P. ciliata*, *P. davidsonii*, *P. distans*, *P. heterophylla*, *P. hydrophylloides*, *P. ramosissima*, but also visits other flowers including *Collinsia wrightii*, *Mimulus rubellus*, *Nemophila integrifolia*, *N. menziesii*.

*Osmia albomarginata* Cockerell, 1935. Pan-Pacific Ent. 11: 49. ♀, ♂.

Biology: Parker, 1975. Pan-Pacific Ent. 51: 116-119, figs. 7-8, table 1 (nest, cocoon, parasites).

**copelandica arefacta** (Cockerell). South. Calif., deserts. Parasite: *Leucospis affinis* Say. Pollen:

Apparently an oligolege of *Phacelia* including *P. distans*, but also visits other flowers presumably for nectar including *Cryptantha intermedia*, *Malacothrix glabrata*.

Predator: *Cymatodera* sp.

*Osmia arefacta* Cockerell, 1935. Pan-Pacific Ent. 11: 42. ♀, ♂.

Biology: Parker, 1975. Pan-Pacific Ent. 51: 116, 117, 119, fig. 9, table 1 (nest, cocoon, nest associates).

**copelandica copelandica** (Cockerell). Colo., Utah, Wyo., Mont., Idaho, east. Oreg., Wash., B. C.

Pollen: Apparently an oligolege of *Phacelia*.

*Osmia copelandica* Cockerell, 1908. Entomologist 41: 59. ♀.

*Osmia besseyae* Cockerell, 1910. Entomologist 43: 92. ♀, ♂.

Biology: Parker, 1975. Pan-Pacific Ent. 51: 116 (Idaho nests only).

**phaceliarum** (Cockerell). South. Calif. Pollen: Apparently an oligolege of *Phacelia* including *P. distans*.

*Osmia phaceliarum* Cockerell, 1935. Pan-Pacific Ent. 11: 45. ♀.

### Genus ANTHOCOPA Subgenus EREMOSMIA Michener

*Anthocopa* subg. *Eremosmia* Michener, 1943. Ent. Soc. Amer., Ann. 36: 66.

Type-species: *Osmia robustula* Cockerell. Orig. desig.

*Anthocopa* subg. *Phaeosmia* Michener, 1943. Ent. Soc. Amer., Ann. 36: 77.

Type-species: *Osmia enceliae* Cockerell. Orig. desig.

Revision: Michener, 1949. Kans. Ent. Soc., Jour. 22: 53 (spp. formerly placed in *Phaeosmia*).

**beameri** Michener. Tex. (Big Bend Natl. Park, Marathon). Pollen: Unknown, but visits flowers of *Nama*, *Phacelia*.

*Anthocopa* (*Eremosmia*) *beameri* Michener, 1951. Pan-Pacific Ent. 27: 64. ♀, ♂.

**daleae** Michener. Tex. (Big Bend Natl. Park, Sanderson). Pollen: Unknown, but visits flowers of *Dalea*, *Phacelia*.

*Anthocopa* (*Phaeosmia*) *daleae* Michener, 1951. Pan-Pacific Ent. 27: 62. ♀, ♂.

**enceliae enceliae** (Cockerell). South. Calif., desert border. Pollen: Unknown, but visits flowers of *Baileya*, *Encelia farinosa*.

*Osmia enceliae* Cockerell, 1935. Pan-Pacific Ent. 11: 43. ♀.

**enceliae mortua** (Cockerell). Ariz., Calif., Nev. Pollen: Unknown, but visits flowers of *Encelia actoni*, *E. farinosa*.

*Osmia viguierae* var. *mortua* Cockerell, 1935. Pan-Pacific Ent. 11: 44. ♀, ♂.

*Anthocopa* (*Eremosmia*?) *mallognatha* Michener, 1943. Ent. Soc. Amer., Ann. 36: 67. ♀.

**hemizoniae** (Cockerell). South. Calif. Pollen: Unknown, but visits flowers of *Helianthus gracilentus*, *Hemizonia paniculata*.

*Osmia hemizoniae* Cockerell, 1935. Pan-Pacific Ent. 11: 47. ♀.

Taxonomy: Michener, 1954. Pan-Pacific Ent. 30: 50. ♂.

**hypostomalis** Michener. Calif. Ecology: Nests in preexisting burrows in wood including prebored elderberry trap stems. Parasite: *Leucospis affinis* Say, *Sphaerophthalma amphion* (Fox), *Stelis* sp. Pollen: Apparently an oligolege of *Dalea* including *D. fremontii*, *D. schottii*, but also visits other flowers including *Cryptantha barbiger*, *Palafoxia linearis*. Predator: *Cymatodera* sp.

*Anthocopa* (*Phaeosmia*) *hypostomalis* Michener, 1949. Kans. Ent. Soc., Jour. 22: 50. ♀.

Taxonomy: Michener, 1954. Pan-Pacific Ent. 30: 49. ♂.

Biology: Parker, 1975. Pan-Pacific Ent. 51: 113-116, figs. 1-6, table 1 (nest, cocoon, sex ratio, nest associates).

**maryae** Michener. Tex. Pollen: Unknown, but visits flowers of *Dalea*.

*Anthocopa* (*Phaeosmia*) *maryae* Michener, 1949. Kans. Ent. Soc., Jour. 22: 50. ♀.

**mirifica** Michener. Calif. (Inyo and Riverside Cos.). Pollen: Unknown, but visits flowers

*Chaenactis brachypappa*, *C. carphoclinia*, *Cryptantha*, *Encelia farinosa*.

*Anthocopa mirifica* Michener, 1954. Pan-Pacific Ent. 30: 51. ♀, ♂.

**namatophila** Michener. Calif. (Twentynine Palms). Pollen: Unknown, but visits flowers *Nama demissum*.

*Anthocopa namatophila* Michener, 1954. Pan-Pacific Ent. 30: 47. ♀.

**nitidivitta** Michener. South. and east. Calif., desert. Pollen: Unknown, but visits flowers of *Astragalus fremontii*, *Dalea fremontii*, *Mentzelia albicaulis*, *Nama demissum*, *Phacelia*.

*Anthocopa* (*Eremosmia*) *nitidivitta* Michener, 1943. Ent. Soc. Amer., Ann. 36: 70. ♀, ♂.

**robustula** (Cockerell). South. and east. Calif., Nev. Pollen: Unknown, but visits flowers of *Astragalus coulteri*, *Cercidium floridum*, *Cryptantha barbiger*, *Dalea californica*, *D. fremontii*, *D. polyadenia*, *D. saundersii*, *D. schottii*, *Geraea canescens*, *Lotus scoparius*, *Lupinus odoratus*, *Palafoxia linearis*, *Senecio*.

*Osmia robustula* Cockerell, 1935. Pan-Pacific Ent. 11: 44. ♀.

- rupestris** (Cockerell). South. and east. Calif., desert. Pollen: Unknown, but visits flowers of *Chaenactis stevioides*, *Eriodictyon trichocalyx*, *Larrea tridentata*, *Nama demissum*, *Phacelia distans*.  
*Osmia rupestris* Cockerell, 1935. Pan-Pacific Ent. 11: 47. ♀.
- segregata** Michener. Calif. (Inyo Co.). Pollen: Unknown, but visits flowers of *Dalea fremontii*.  
*Anthocopa segregata* Michener, 1954. Pan-Pacific Ent. 30: 48. ♀.
- timberlakei** (Cockerell). South. Calif., desert. Pollen: Unknown, but visits flowers of *Astragalus fremontii*, *Palafolia linearis*.  
*Osmia timberlakei* Cockerell, 1935. Pan-Pacific Ent. 11: 41. ♀.
- viguierae** (Cockerell). South. Calif., desert border. Pollen: Apparently an oligolectic of vernal flowering Compositae including *Encelia farinosa*, *Enceliopsis argophylla* var. *grandiflora*, *Viguiera parishii*, but also visits flowers of *Hyptis emoryi*.  
*Osmia viguierae* Cockerell, 1935. Pan-Pacific Ent. 11: 44. ♀ (♂ misdet.).

#### Genus ANTHOCOPA Subgenus ISOSMIA Michener and Sokal

- Anthocopa* subg. *Isosmia* Michener and Sokal, 1957. Evolution 11: 159.  
 Type-species: *Anthocopa (Phaeosmia) rubrella* Michener. Orig. design.
- hurdiana** Michener. Calif. (Panamint Mts.). Pollen: Unknown, but visits flowers of *Dalea fremontii*.  
*Anthocopa hurdiana* Michener, 1954. Pan-Pacific Ent. 30: 47. ♀, ♂.
- rubrella macswaini** Michener. Calif., Nev. Pollen: Unknown, but visits flowers of *Dalea mollis*.  
*Anthocopa rubrella macswaini* Michener, 1954. Pan-Pacific Ent. 30: 45. ♀, ♂.
- rubrella rubrella** Michener. Tex.; Mexico (Sonora). Pollen: Unknown, but visits flowers of *Dalea*.  
*Anthocopa (Phaeosmia) rubrella* Michener, 1949. Kans. Ent. Soc., Jour. 22: 51. ♀, ♂.
- rubrella rubrior** Michener. South. Calif. Pollen: Unknown, but visits flowers of *Dalea mollis*.  
*Anthocopa rubrella rubrior* Michener, 1954. Pan-Pacific Ent. 30: 46. ♀, ♂.

#### Genus ASHMEADIELLA Cockerell

Revision: Michener, 1936. Amer. Mus. Novitates 875: 1-16. — Michener, 1939. Amer. Midland Nat. 22: 1-84 (Nearctic spp.).

Taxonomy: Michener, 1953. Kans. Univ. Sci. Bul. 35: 1051, figs. 134, 138, 139, 141 (larva). — Hurd and Michener, 1955. Calif. Ins. Survey, Bul. 3: 153-215, pls. 10, 23-24, figs. 2, 112-141, maps 77-111 (Calif. spp.). — Michener and Sokal, 1957. Evolution 11: 130-162 (phenetic classification of the *Hoplitis* complex). — Sokal and Michener, 1958. Kans. Univ. Sci. Bul. 38: 1409-1438 (systematic relationships within the *Hoplitis* complex). — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 53-56, figs. 1, 17-18, table 3 (eastern U. S. spp.). — Rubin, 1966. Syst. Zool. 15: 176-182, tables 1-3 (phenetic classification of the *Hoplitis* complex). — Michener and Sokal, 1966. Ent. Soc. Amer., Ann. 59: 1211-1217, 5 figs. (phenetic similarities among species of the *Hoplitis* complex).

Biology: Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 36 (*Larrea* visiting spp.).

Morphology: Michener, 1943. Pan-Pacific Ent. 19: 96-100 (sex anomalies).

#### Genus ASHMEADIELLA Subgenus CHILOSIMA Michener

- Ashmeadiella* subg. *Chilosima* Michener, 1939. Amer. Midland Nat. 22: 78.  
 Type-species: *Ashmeadiella rhodognatha* Cockerell. Orig. design.
- holtii** Cockerell. N. Mex., Ariz., deserts.  
*Ashmeadiella holtii* Cockerell, 1898. Canad. Ent. 30: 51. ♂.
- rhodognatha** Cockerell. Tex., Nev. South. and east. Calif.; north. Mexico (Baja California and Sonora). Pollen: Unknown, but visits flowers of *Cercidium torreyanum*, *Cryptantha angustifolia*, *Dalea californica*, *D. emoryi*, *D. fremontii*, *D. neomexicana*, *D. polyadenia*,

*D. schottii*, *Heliotropium curassavicum*, *Larrea tridentata*, *Melilotus*, *Nama hispidum*, *Olneya tesota*, *Pluchea sericea*, *Prosopis glandulosa* var. *torreyanum*.  
*Ashmeadiella rhodognatha* Cockerell, 1924. Calif. Acad. Sci., Proc. (4) 12: 557. ♀.

Taxonomy: Michener, 1942. Ent. News 53: 51. — Michener, 1943. Pan-Pacific Ent. 19: 96.

### Genus ASHMEADIELLA Subgenus ASHMEADIELLA Cockerell

*Ashmeadiella* Cockerell, 1897. Ent. News 8: 197.

Type-species: *Heriades opuntiae* Cockerell. Orig. desig.

*Titusella* Cockerell, 1906. Amer. Mus. Nat. Hist., Bul. 22: 445.

Type-species: *Titusella pronitens* Cockerell. Monotypic.

Taxonomy: Michener and Sokal, 1957. Evolution 11: 159 (synonymy).

*altadenae* Michener. South. and cent. Calif. Pollen: Unknown, but visits flowers of *Adenostoma fasciculatum*, *Lotus scoparius*.

*Ashmeadiella altadenae* Michener, 1936. Pan-Pacific Ent. 12: 63. ♂.

Taxonomy: Michener, 1954. Kans. Ent. Soc., Jour. 27: 75. ♀.

*aridula aridula* Cockerell. Wash., Oreg., Calif., Nev., Utah, Idaho, Wyo., Colo. Parasite: *Anthrax irroratus* Say, *Chrysura sonorensis* (Cam.), *Epistenia* sp., *Leucospis affinis* Say, *Sapyga pumila* Cress. Pollen: Presumably polylectic, visits a wide variety of flowers including *Chaetopappa aurea*, *Cleomella obtusifolia*, *Cryptantha intermedia*, *C. Micrantha*, *Eriogonum gracile*, *Eriodictyon*, *Gutierrezia lucida*, *G. sarothrae*, *Heliotropium curassavicum* var. *oculatum*, *Lotus americanus*, *L. argyrophyllus*, *L. canadensis*, *L. davidsonii*, *L. glaber*, *L. hamatus*, *L. nevadensis*, *Nama parryi*, *Phacelia imbricata*, *P. ramosissima*, *Prosopis*, *Sidalcea malvaeflora*, *Solidago californica*, *Sphaeralcea ambigua*, *Viguiera nevadensis*.

*Ashmeadiella aridula* Cockerell 1910. Entomologist 43: 91. ♂.

*aridula astragali* Michener. Wash., Wyo., Oreg., Calif., Nev. Pollen: Presumably polylectic, visits a wide variety of flowers including *Astragalus bolanderi*, *Calycadenia multiglandulosa*, *Centromadia pungens*, *Cressa cretica*, *Dalea polyadenia*, *Euphorbia*, *Grindelia camporum*, *Heliotropium curassavicum* var. *obovatum*, *H. c.* var. *oculatum*, *Hemizonia pungens*, *Lotus americanus*, *L. glaber*, *Marrubium vulgare*, *Melilotus alba*, *Phacelia distans*, *Solidago californica*, *Trichostema laxum*, *Trifolium*.

*Ashmeadiella* (*Ashmeadiella*) *cactorum astragali* Michener, 1939. Amer. Midland Nat. 22: 44. ♀, ♂.

Taxonomy: Michener, 1954. Kans. Ent. Soc., Jour. 27: 74 (geogr. records and variation).

Morphology: Snelling, 1962. Pan-Pacific Ent. 38: 229-230, fig. 1 (intersex).

*bigeloviae* (Cockerell). Tex., to south. Calif., Nev.; north. Mexico. Ecology: Nests readily in trap nests. Parasite: *Anthrax irroratus* Say, *Chrysura sonorensis* (Cam.), *Leucospis affinis* Say, *Monodontomerus anthidii* (Ashm.), *Nemognatha nigripennis* LeC., *Pyemotes ventricosus* (Newport). Pollen: Polylectic, visits a wide variety of flowers including *Acacia greggii*, *Asclepias galioides*, *Baileya pleniradiata*, *Bebbia juncea*, *Cercidium floridum*, *C. torreyanum*, *Cleomella obtusifolia*, *Coldenia palmeri*, *Cryptantha barbiger*, *C. intermedia*, *Dalea fremontii*, *D. mollis*, *D. spinosa*, *Echinocereus engelmannii*, *Eriastrum virgatum*, *Eriogonum deflexans*, *E. deserticola*, *E. fasciculatum*, *E. f.* var. *polifolium*, *E. inflatum*, *E. trichops*, *Eucnide urens*, *Geraea canescens*, *Gutierrezia californica*, *G. lucida*, *G. sarothrae*, *Haplopappus acradeni*, *H. palmeri*, *Helenium laciniatum*, *Heliotropium curassavicum*, *Hymenopappus flavescens*, *Isomeris arborea*, *Larrea tridentata*, *Lepidium alysoides*, *Lotus davidsonii*, *Medicago sativa*, *Melilotus alba*, *Monardella exilis*, *Pectis papposa*, *Petalonyx thurberi*, *Phacelia crenulata*, *Pyrrhopappus multicaulis*, *Prosopis*, *Rhus trilobata*, *Salvia pilosa*, *Senecio douglasii*, *Sesuvium sessile*, *Sphaeralcea ambigua*, *S. orcutti*, *Stephanomeria pauciflora*, *Tamarix gallica*, *Thelypodium cooperi*, *Tidestromia oblongiflora*, *Verbesina auriculata*, *Wislizenia refracta*. Predator: *Trichodes ornatus* Say.

*Heriades bigeloviae* Cockerell, 1897. Ann. and Mag. Nat. Hist. (6) 20: 136. ♂, ♀.

Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 282-284 (nest architecture, supersedure, parasite).

**biscopula** Michener. Ariz., N. Mex. Pollen: Unknown, but visits flowers of *Prosopis*.

*Ashmeadiella (Titusella) biscopula* Michener, 1935. Amer. Midland Nat. 22: 54. ♀.

**bucconis buconis** (Say). N. Dak., south to N. Mex. and Tex., east to Wis., Ill., Ind., Mo., Ark., La. and Ga. Pollen: Appears to collect pollen principally from the Compositae, visits flowers of *Ambrosia psilostachya*, *Anthemis cotula*, *Brauneria pallida*, *Callirrhoe involucreta*, *Coreopsis*, *Gaillardia pulchella*, *Grindelia squarrosa*, *Helenium laciniatum*, *Helianthus petiolaris*, *Heliopsis helianthoides*, *Lactuca pulchella*, *Monarda*, *Petalostemon*, *Sideranthus*, *Solidago*, *Tetragonotheca ludoviciana*, *Verbena*, *Verbesina*. *Osmia buconis* Say, 1837. Boston Jour. Nat. Hist. 1: 400. ♀, ♂.

*Megachile osmioides* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 269. ♀, ♂.

Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 54-55, fig. 17 (redescription).

**bucconis denticulata** (Cresson). B. C. to Calif., east to Mont., Wyo., Colo., N. Mex. and Tex.; Mexico. Ecology: Nests readily in trap-nests. Parasite: *Anthrax irroratus* Say, *Chrysura sonorensis* (Cam.), *Leucospis affinis* Say, *Nemognatha nigripennis* LeC., *Pyemotes ventricosus* (Newport). Pollen: Appears to collect pollen principally from the Compositae, visits flowers of *Acamptopappus sphaerocephalus*, *Adenostoma sparsifolium*, *Aster tephrodes*, *Baileya multiradiata*, *B. pleniradiata*, *Chaenactis glabriuscula*, *Chrysothamnus nauseosus*, *Coreopsis grandiflora*, *C. lanceolata*, *Cryptantha intermedia*, *Encelia californica*, *E. farinosa*, *Eremocarpus setigerus*, *Erigeron divergens*, *E. foliosus* var. *stenophyllus*, *Eriogonum gracile*, *Eriophyllum confertiflorum*, *Gnaphalium californicum*, *Grindelia camporum*, *G. hallii*, *G. nana*, *Gutierrezia californica*, *G. lucida*, *G. sarothrae*, *Haplopappus acradenioides*, *H. squarrosus*, *H. teretifolius*, *H. venetus*, *H. vernonioides*, *Helianthus*, *Heterotheca grandiflora*, *Navaretia viscidula*, *Pectis papposa*, *Penstemon*, *Senecio douglasii*, *Solidago californica*, *Stephanomeria exigua*.

*Heriades? denticulatum* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 108. ♂.

*Heriades? rotundiceps* Cresson, 1879. Amer. Ent. Soc., Trans. 7: 205. ♀.

*Ashmeadiella wislizeni* Cockerell, 1922. Ann. and Mag. Nat. Hist. (9) 10: 545. ♂.

Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 285-286 (nest architecture, life history, parasites).

**cactorum basalis** Michener. South. and cent. Calif., west of deserts, also isolated localities in east Calif. Pollen: Apparently polylectic, visits flowers of *Baileya multiradiata*, *Castilleja*, *Chilopsis linearis*, *Chrysopsis villosa*, *Chrysothamnus*, *Cordylanthus nevadensis*, *C. pilosus*, *Cryptantha inaequalis*, *C. intermedia*, *C. micrantha* var. *lepidota*, *Dalea fremontii*, *Encelia farinosa*, *Erigeron divergens*, *Eriastrum virgatum*, *Eriogonum fasciculatum*, *E. wrightii* subscaposum, *Eryngium aristatum*, *Grindelia camporum*, *Gutierrezia californica*, *G. sarothrae*, *Lotus argophyllus*, *L. davidsonii*, *L. glaber*, *L. nevadensis*, *L. rosea*, *L. scoparius*, *Mimulus*, *Monardella linoides* var. *stricta*, *Penstemon bridgesii*, *P. grinnellii*, *P. ternatus*, *Phacelia heterophylla*, *P. imbricata*, *P. ramosissima*, *Salvia pachyphylla*, *Trichostema lanatum*, *T. parishii*, *Verbena lasiostachys*.

*Ashmeadiella basalis basalis* Michener, 1936. Amer. Mus. Novitates 875: 6. ♂, ♀.

**cactorum cactorum** (Cockerell). B. C., Wash., Oreg., north. and east. Calif., Mont., Wyo., Utah, Colo., Ariz., N. Mex., Tex.; north. Mexico. Pollen: Stores pollen of *Prosopis* and small amounts of *Anisacanthus*, but is most probably quite polylectic; visits a wide variety of flowers including *Allium parvum*, *Asclepias tuberosa*, *Chilopsis linearis*, *Clarkia pulchella*, *C. rhomboidea*, *Cordylanthus nevadensis*, *Cryptantha*, *Dalea argyrea*, *D. pogonothera*, *Echinocereus*, *Encelia farinosa*, *Eriastrum virgatum*, *Erigeron divergens*, *E. stenophyllus*, *Eriogonum fasciculatum*, *Lasthenia chrysostoma*, *Lotus argyrophyllus*, *L. scoparius*, *Monardella stricta*, *Nema rothrockii*, *Opuntia*, *Penstemon ternatus*, *Phacelia ramosissima*, *Trichostema lanatum*.

*Heriades cactorum* Cockerell, 1897. Ann. and Mag. Nat. Hist. (6) 20: 140. ♀.

*Ashmeadiella curriei* Titus, 1904. Ent. Soc. Wash., Proc. 6: 100. ♀.

*Ashmeadiella echinocerei* Cockerell, 1911. Canad. Ent. 43: 132. ♀.

*Ashmeadiella echinoacti*(!) Cockerell, 1931. Ann. and Mag. Nat. Hist. (8) 10: 543.

*Ashmeadiella basalis nigra* Michener, 1936. Amer. Mus. Novitates 875: 7. ♀, ♂.

Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 286-288 (nest architecture, larval food, life history, cocoon).

**californica californica** (Ashmead). B. C. to Calif. (except deserts and Sierra Nevada Mts.), Idaho, Nev., Utah; Mexico (Baja California). Parasite: *Anthrax irroratus* Say, *Chrysura* sp., *Leucospis affinis* Say, *Sphaerophthalma unicolor* (Cress.), *Stelis ashmeadiellae* Timberlake. Pollen: Apparently polylectic, visits a wide variety of flowers including *Asclepias*, *Aster adscendens* var. *yosemitanus*, *Calycadenia multiglandulosa*, *Camissonia campestris*, *Centaurea melitensis*, *Chaenactis glabriuscula*, *Chorizanthe staticoides*, *Chrysothamnus*, *Corethrogyne*, *Cressa cretica*, *Cryptantha intermedia*, *Encelia californica*, *E. farinosa*, *Eriastrum virgatum*, *Erigeron divergens*, *E. foliosus* var. *stenophyllus*, *Eriogonum fasciculatum*, *E. subscaposum*, *Eriophyllum confertiflorum*, *Eupatorium occidentale*, *Frankenia grandiflora*, *Gilia multicaulis*, *Grindelia camporum*, *G. elata*, *Gutierrezia californica*, *G. sarothrae*, *Haplopappus linearifolius*, *H. parishii*, *H. squarrosus*, *H. vernonioides*, *Helianthus gracilentus*, *Hemizonia fasciculata*, *H. luzulaefolia*, *H. paniculata*, *H. wrightii*, *Heterotheca grandiflora*, *Lessingia germanorum*, *L. grandiflora*, *L. leptoclada*, *L. tenuis*, *Lotus americanus*, *L. glaber*, *L. hamatus*, *L. scoparius*, *Medicago sativa*, *Melilotus*, *Monardella douglasii*, *M. stricta*, *Navarretia heterodoxa*, *N. viscidula*, *Pentachaeta aurea*, *Phacelia ciliata*, *P. davidsonii*, *Potentilla glandulosa*, *Senecio douglasii*, *Sesuvium sessile*, *Solidago lasiostachys*, *Stephanomeria exigua*, *Verbena prostrata*, *Viguiera*.

*Chalicodoma californica* Ashmead, 1897. South. Calif. Acad. Sci., Proc. 1 (3): 1. ♂, ♀. *Ashmeadiella coquilletti* Titus, 1904. Ent. Soc. Wash., Proc. 6: 99. ♀, ♂.

Biology: Timberlake, 1941. N. Y. Ent. Soc., Jour. 49: 134 (parasite).

**californica florissantensis** Michener. Idaho, Wyo., Colo., N. Mex. Pollen: Unknown, but visits flowers of *Aster*, *Chrysopsis*.

*Ashmeadiella florissantensis* Michener, 1936. Pan-Pacific Ent. 12: 62. ♂, ♀.

**californica sierraensis** Michener. Calif. (Sierra Nevada Mts.). Pollen: Apparently polylectic, principally flowers of Compositae, including *Aster adscendens*, *A. foliaceus*, *Erigeron*, *Helianthus*, *Senecio canus*, *Solidago multiradiata*.

*Ashmeadiella* (Ashmeadiella) *californica sierraensis* Michener, 1939. Amer. Midland Nat. 22: 51. ♀, ♂.

**cockerelli** Michener. South. Calif.

*Ashmeadiella cockerelli* Michener, 1936. Pan-Pacific Ent. 12: 62. ♂.

**cubiceps clypeata** (Michener). Calif., low and middle altitudes; Mexico (Baja California).

Parasite: *Chrysura* sp., *Leucospis affinis* Say, *Monodontomerus anthidii* (Ashm.).

Pollen: Apparently polylectic, principally Compositae, visits flowers of *Baileya*, *Chaenactis*, *Cryptantha*, *Encelia*, *Eriophyllum confertiflorum*, *Haplopappus linearifolius*, *Hemizonia*, *Lessingia germanorum*, *Melilotus*, *Sphaeralea*, *Viguiera*. *Titusella clypeata* Michener, 1936. South. Calif. Acad. Sci., Bul. 35: 93. ♀.

**cubiceps cubiceps** (Cresson). Nev., Calif., Oreg., high mts.

*Heriades? cubiceps* Cresson, 1879. Amer. Ent. Soc., Trans. 7: 205. ♀.

**difugita difugita** Michener. South. Calif. Pollen: Unknown, but visits flowers of *Chrysopsis fastigiata*, *Eriodictyon trichocalyx*, *Eriogonum fasciculatum*, *E. inflatum*, *Gilia*, *Phacelia heterophylla*, *Verbena lasiostachys*.

*Ashmeadiella* (Ashmeadiella) *difugita* Michener, 1939. Amer. Midland Nat. 22: 41. ♀, ♂.

**difugita emarginatula** Michener. Calif. (Sierra Nevada Mts.), Oreg., Idaho, Nev. Pollen: Unknown, but visits flowers of *Camissonia clavaeformis citrina*, *C. tanacetifolia*, *Chrysothamnus nauseosus*, *Cirsium tiogonum*, *Clarkia*, *Eriogonum*, *Grindelia*, *Haplopappus apargoides*.

*Ashmeadiella difugita emarginatula* Michener, 1951. Kans. Ent. Soc., Jour. 24: 53. ♀.

Taxonomy: Michener, 1954. Kans. Ent. Soc., Jour. 27: 74 (geogr. and floral records).

**dimalla** Michener. Ariz.

*Ashmeadiella* (Ashmeadiella) *dimalla* Michener, 1939. Amer. Midland Nat. 22: 45. ♀, ♂.

**femorata** (Michener). South. and east. Calif., Nev., Ariz., deserts. Pollen: Unknown, but visits flowers of *Baileya*, *Cercidium floridum*, *C. torreyanum*, *Croton californicus*, *Dalea fremontii*, *Haplopappus interior*, *Hyptis emoryi*, *Larrea tridentata*, *Prosopis pubescens*.  
 Predator: *Cymatodera* sp.

*Osmia femorata* Michener, 1936. South. Calif. Acad. Sci., Bul. 35: 91. ♀.

**floridana** (Robertson). N. C. to Fla. Pollen: Unknown, but visits flowers of *Lupinus*.  
*Heriades floridana* Robertson, 1897. Acad. Sci. St. Louis, Trans. 7: 348. ♀.

Taxonomy: Mitchell, 1962. N. C. Agr. Exp. Sta. Tech. Bul. 152: 55-56, fig. 18, table 3 (redescription).

**foveata** Michener. Cent. and east. Calif., Ariz., Nev., Utah. Ecology: Nests under stones. Pollen: Unknown, but visits flowers of *Collinsia torreyi*, *Cryptantha intermedia*, *Dalea*, *Diplacus aurantiacus*, *Encelia*, *Erigeron miser*, *Haplopappus interior*, *Helianthus gracilentus*, *Heliotropium curassavicum* var. *oculatum*, *Lotus scoparius*, *Monardella lanceolata*, *Phacelia platyloba*, *Prosopis*, *Salvia pilosa*.

*Ashmeadiella* (Ashmeadiella) *foveata* Michener, 1939. Amer. Midland Nat. 22: 39. ♀.

Taxonomy: Michener, 1954. Kans. Ent. Soc., Jour. 27: 74. ♂.

**gillettei cismontana** Michener. Calif. (Riverside, Fresno, Contra Costa Cos.). Pollen: Unknown, but visits flowers of *Cryptantha intermedia*, *Eriastrum virgatum*, *Eriogonum*, *Heliotropium curassavicum* var. *oculatum*, *Melilotus*.  
*Ashmeadiella* (Ashmeadiella) *gillettei cismontana* Michener, 1951. Pan-Pacific Ent. 27: 67. ♀.

Taxonomy: Michener, 1954. Kans. Ent. Soc., Jour. 24: 52. ♂.

**gillettei gillettei** Titus. Colo., N. Dak., S. Dak., Nebr. Pollen: Unknown, but visits flowers of *Sedum stenopetalum*.

*Ashmeadiella gillettei* Titus, 1904. Ent. Soc. Wash., Proc. 6: 100. ♀.

*Ashmeadiella coloradensis* Cockerell, 1934. Amer. Mus. Novitates 732: 4. ♂.

**gillettei rubra** Michener. Tex., N. Mex. Pollen: Unknown, but visits flowers of *Dalea formosa*.  
*Ashmeadiella* (Ashmeadiella) *gillettei rubra* Michener, 1951. Pan-Pacific Ent. 27: 67. ♀, ♂.

**gillettei rufiventris** Michener. South. and east. Calif.; Mexico (Baja California). Parasite: *Anthrax irroratus* Say, *Chrysura* sp., *Leucospis affinis* Say, *Stelis* sp. Pollen: Unknown, but visits flowers of *Aster abatus*, *Astragalus fremontii*, *Baileya pleniradiata*, *Cercidium floridum*, *C. torreyanum*, *Chaenactis carphoclinia*, *Cryptantha*, *Dalea mollis*, *Geraea canescens*, *Heliotropium curassavicum*, *Lupinus*, *Malacothrix*, *Palafoxia linearis*, *Phacelia distans*, *Prosopis glandulosa* var. *torreyanum*, *Stephanomeria*.  
 Predator: *Cymatodera* sp.

*Ashmeadiella* (Ashmeadiella) *rufiventris* Michener, 1939. Amer. Midland Nat. 22: 32. ♀, ♂.

**leucozona** Cockerell. South. Calif., Ariz.; north. Mexico, deserts. Pollen: Unknown, but visits flowers of *Cercidium torreyanum*, *Heliotropium curassavicum* var. *oculatum*, *Nama hispidum*, *Teucrium depressum*.

*Ashmeadiella leucozona* Cockerell, 1924. Calif. Acad. Sci., Proc. (4) 12: 556. ♂, ♀.

**maxima** Michener. Tex.

*Ashmeadiella maxima* Michener, 1936. Pan-Pacific Ent. 12: 61. ♀, ♂.

**meliloti meliloti** (Cockerell). South. Calif., Ariz., N. Mex., Tex.; north. Mexico; deserts. Parasite: *Anthrax irroratus* Say, *Chrysura* sp., *Epistenia* sp., *Leucospis affinis* Say, *Nemognatha nigripennis* LeC., *Sappya pumila* Cress., *Stelis* sp. Pollen: Apparently polylectic, analyzed pollen masses (2) ranged from 100 per cent *Prosopis* to a mixture of several pollens consisting of 74 per cent *Stemodia* and 26 per cent *Chenopodiaceae* with traces of pollen from *Acacia*, *Krameria*, entomophilous *Compositae* and *Pinus*; visits a wide variety of flowers including *Acacia greggii*, *Acamptopappus sphaerocephalus*, *Baileya multiradiata*, *Chilopsis linearis*, *cleome*, *Cryptantha*, *Crusea subulata*, *Dalea argyrea*, *D. formosa*, *D. pogonathera*, *Eriogonum gracile*, *E. inflatum*, *Eriastrum virgatum*, *Gutierrezia californica*, *G. lucida*, *Haplopappus interior*, *Heliotropium curassavicum* var. *oculatum*, *Lepidium alyssoides*, *L. montanum*, *Lotus davidsonii*, *Melilotus alba*, *Opuntia megacarpa*, *Penstemon*, *Phacelia cicutaria*, *P. ramosissima*, *Prosopis glandulosa* var. *torreyanum*, *Pyrrhopappus multicaulis*, *Rhus trilobata*,

- Salvia pilosa*, *Solidago californica*, *Sphaeralcea ambigua*, *Viguiera nevadensis*.  
 Predator: *Cymatodera* sp., *Trichodes horni* Wolcott and Chapin. Another subspecies, *crassa* Ckll., occurs in Mexico (Baja California).  
*Heriades meliloti* Cockerell, 1897. Ann. and Mag. Nat. Hist. (6) 20: 141. ♂, ♀.
- Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 288-290 (nest architecture, larval food, life history, supersedure, parasites and predators).
- occipitalis** Michener. South. Ariz., west. Tex.; Mexico (Sonora, Baja California). Ecology: Readily nests in trap-nests. Parasite: *Chrysura sonorensis* (Cam.), *Nemognatha nigripennis* LeC. Predator: *Pyemotes ventricosus* (Newport), *Trichodes horni* Wolcott and Chapin.  
*Ashmeadiella* (*Ashmeadiella*) *occipitalis* Michener, 1939. Amer. Midland Nat. 22: 22. ♀, ♂.
- Taxonomy: Michener, 1954. Kans. Ent. Soc., Jour. 27: 76 (geogr. records, tax. characters of female).
- Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 290-294, pl. 17, fig. 78 (nest architecture, larval food, life history, male production, supersedure, parasites, predators).
- opuntiae** (Cockerell). Tex. to south. Calif., Utah and Colo.; north. Mexico (Sonora). Parasite: *Anthrax irroratus* Say, *Chrysura* sp., *Leucospis affinis* Say, *Melittobia chalybii* Ashm. Pollen: Oligolege of Cactaceae, analyzed pollen masses (4) contained 95.2 per cent *Opuntia* pollen of the subgenus *Cylindropuntia* and 4.8 per cent pollen of the subgenus *Platyopuntia*; obtains pollen and nectar from flowers of Cactaceae including *Echinocactus cylindraceus*, *Echinocereus engelmannii*, *Ferrocactus acanthodes*, *Opuntia echinocarpa*, *O. megacarpa*, *O. occidentalis*, *O. parryi*, *O. vaseyi*, but also visits other flowers for nectar including *Chrysothamnus*, *Penstemon*, *Viguiera nevadensis*.  
 Predator: *Cymatodera* sp.  
*Heriades opuntiae* Cockerell, 1897. Ann. and Mag. Nat. Hist. (6) 20: 139. ♀.  
*Ashmeadiella submaxima* Michener, 1936. Amer. Mus. Novitates 875: 3. ♂.  
*Ashmeadiella arizonensis* Michener, 1936. Amer. Mus. Novitates 875: 3. ♂.
- Taxonomy: Michener, 1943. Pan-Pacific Ent. 19: 97. —Hurd and Michener, 1955. Calif. Ins. Survey, Bul. 3: 192 (synonymy).
- Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 294-295 (nest architecture, larval food, life history, parasite).
- pronitens** (Cockerell). Colo., Wyo.  
*Titusella pronitens* Cockerell, 1906. Amer. Mus. Nat. Hist., Bul. 22: 446. ♀.
- prosopidis** (Cockerell). Tex. to south. Calif.; north. Mexico, deserts. Pollen: Apparently an oligolege of *Prosopis* including *P. glandulosa* var. *torreyanum*, *P. pubescens*, but visits other flowers presumably for nectar including *Acacia greggii*, *Cryptantha barbiger*, *Heliotropium curassavicum*, *Larrea tridentata*, *Melilotus*, *Pluchea sericea*, *Salix nigra*, *Sphaeralcea ambigua*.  
*Heriades prosopidis* Cockerell, 1897. Ann. and Mag. Nat. Hist. (6) 20: 140. ♀ (♂ misdet.).  
*Ashmeadiella schwarzi* Titus, 1904. Ent. Soc. Wash., Proc. 6: 98. ♀, ♂.  
*Ashmeadiella subangusta* Cockerell, 1924. Calif. Acad. Sci., Proc. (4) 12: 588. ♀.
- Taxonomy: Hurd and Michener, 1955. Calif. Ins. Survey, Bul. 3: 161 (synonymy).
- rufipes** Titus. South. and east. Calif., north. Mexico, deserts. Parasite: *Monodontomerus anthidii* (Ashm.), *Stelis* sp. Pollen: Unknown, but visits flowers of *Abronia*, *Cryptantha barbiger*, *C. intermedia*, *Dalea emoryi*, *D. mollis*, *Heliotropium curassavicum*, *H. c.* var. *oculatum*, *Palafoxia linearis*, *Pectis papposa*, *Petalonyx thurberi*, *Tidestromia oblongiflora*.  
*Ashmeadiella rufipes* Titus, 1904. Ent. Soc. Wash., Proc. 6: 99. ♀.  
*Ashmeadiella haematopoda* Cockerell, 1924. Calif. Acad. Sci., Proc. (4) 12: 555. ♀.  
*Ashmeadiella rhodopus* Michener, 1936. Pan-Pacific Ent. 12: 59. ♂, ♀.
- Taxonomy: Michener, 1936. Pan-Pacific Ent. 12: 58. ♀, ♂. —Hurd and Michener, 1955. Calif. Ins. Survey Bul. 3: 175-177 (synonymy).



- rufitarsis** Michener. Calif. Pollen: Apparently an oligolege of *Eriogonum*, including *E. fasciculatum*, *E. gracile*, *E. vimineum*, but also visits other flowers presumably for nectar including *Euphorbia*.  
*Ashmeadiella (Ashmeadiella) rufitarsis* Michener, 1939. Amer. Midland Nat. 22: 37. ♀, ♂.
- sonora** Michener. Calif., Ariz., Utah; north. Mexico (Baja California). Pollen: Unknown, but visits flowers of *Asclepias*, *Baileya multiradiata*, *Dalea*, *Eriastrum virgatum*, *Eriogonum trichopes*, *Euphorbia polycarpa* var. *hirtella*, *Fouquieria splendens*, *Gutierrezia sarothrae*, *Lepidium alyssoides*, *Olneya tesota*, *Pectis papposa*.  
*Ashmeadiella (Ashmeadiella) sonora* Michener, 1939. Amer. Midland Nat. 22: 35. ♂, ♀.
- stevensi** Michener. N. Dak.  
*Ashmeadiella stevensi* Michener, 1937. Ann. and Mag. Nat. Hist. (10) 19: 405. ♀.
- titusi** Michener. Calif. Pollen: Possibly an oligolege of *Lotus* including *L. scoparius*, but visits other flowers presumably for nectar including *Helianthus gracilentus*, *Phacelia ramosissima*.  
*Ashmeadiella (Ashmeadiella) titusi* Michener, 1939. Amer. Midland Nat. 22: 25. ♀, ♂.
- Taxonomy: Snelling, 1962. Pan-Pacific Ent. 38: 230 (geogr. and floral records).
- truncativentris** Michener. Tex. (Sanderson). Pollen: Unknown, but visits flowers of *Dalea*.  
*Ashmeadiella (Ashmeadiella) truncativentris* Michener, 1951. Pan-Pacific Ent. 27: 68. ♀, ♂.
- vandykiella** Michener. Tex.  
*Ashmeadiella (Ashmeadiella) vandykiella* Michener, 1949. Kans. Ent. Soc., Jour. 22: 46. ♀, ♂.

#### Genus ASHMEADIELLA Subgenus AROGOCHILA Michener

- Ashmeadiella* subg. *Arogochila* Michener, 1939. Amer. Midland Nat. 22: 58.  
 Type-species: *Ashmeadiella timberlakei* Michener. Orig. desig.
- Ashmeadiella* subg. *Corythochila* Michener, 1939. Amer. Midland Nat. 22: 74.  
 Type-species: *Ashmeadiella inyoensis* Michener. Orig. desig.
- Rhamphorhina* Michener, 1939. Amer. Midland Nat. 22: 8. Republished by Michener and Sokal, 1957. Evolution 11: 135 and 159, lapsus for *Corythochila* Michener.
- australis** (Cockerell). Calif., Nev., Utah. Pollen: Apparently an oligolege of *Penstemon* including *P. breviflorus*, *P. grinnellii*, *P. palmeri*, but visits other flowers presumably for nectar including *Geranium*, *Monardella tinoides* var. *stricta*, *Solidago californica*, *Streptanthus tortuosus*.  
*Chelostoma australis* Cockerell, 1902. South. Calif. Acad. Sci., Bul. 1: 139. ♀.  
*Chelostomopsis australis nanus* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 206. ♀.
- Taxonomy: Snelling, 1962. Pan-Pacific Ent. 38: 234 (geogr. and floral records).
- barberi** Michener. Ariz.  
*Ashmeadiella (Arogochila) barberi* Michener, 1939. Amer. Midland Nat. 22: 61. ♀.
- breviceps** Michener. South. Calif., Ariz., Nev.; Mexico (Baja Calif., Sonora). Parasite: *Chrysura* sp., *Stelis* sp. Pollen: Apparently polylectic, visits a wide variety of flowers including *Cercidium floridum*, *Dalea mollis*, *Dipetalia linifolia*, *Hyptis emoryi*, *Larrea tridentata*, *Prosopis glandulosa* var. *torreyanum*, *Stephanomeria*. Predator: *Cymatodera* sp.  
*Ashmeadiella (Corythochila) breviceps* Michener, 1939. Amer. Midland Nat. 22: 77. ♀, ♂.
- Biology: Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 36 (floral relationships).
- cazieri** Michener. South. and east. Calif., Ariz., deserts. Parasite: *Nemognatha nigripennis* LeC., *Stelis* sp. Pollen: Apparently polylectic, visits flowers of *Cercidium torreyanum*, *Dalea californica*, *D. fremontii*, *D. johnsonii*, *Larrea tridentata*.  
*Ashmeadiella (Arogochila) cazieri* Michener, 1939. Amer. Midland Nat. 22: 72. ♀, ♂.
- clypeodentata clypeodentata** Michener. Ariz., south. Calif., north. Mexico, deserts. Pollen: Apparently polylectic, visits flowers of *Cercidium floridum*, *C. torreyanum*, *Dalea emoryi*, *Heliotropium curassavicum* var. *oculatum*, *Phacelia hispida*, *Prosopis glandulosa* var. *torreyanum*.  
*Ashmeadiella clypeodentata* Michener, 1936. Pan-Pacific Ent. 12: 57. ♀.

Biology: Krombein, 1967. Trap-nesting wasps and bees, p. 295 (nest architecture, life history).

**clypeodentata simplicior** Michener. Tex., Ariz. Pollen: Unknown, but visits flowers of *Prosopis*.

*Ashmeadiella (Arogochila) clypeodentata simplicior* Michener, 1951. Pan-Pacific Ent. 27: 70. ♀.

**erema** Michener. Tex., Ariz., south Calif., deserts. Pollen: Unknown, but visits flowers of *Dalea* including *D. fremontii*.

*Ashmeadiella (Arogochila) erema* Michener, 1939. Amer. Midland Nat. 22: 65. ♀.

**eurynorhyncha** Michener. East. Calif., desert. Pollen: Unknown, but visits flowers of *Dalea fremontii*.

*Ashmeadiella (Arogochila) eurynorhyncha* Michener, 1939. Amer. Midland Nat. 22: 62. ♀, ♂.

**foxiella** Michener. Wash., Oreg., cent. Calif., Idaho. Pollen: Unknown, but visits flowers of *Penstemon*, *Phacelia*.

*Ashmeadiella (Arogochila) foxiella* Michener, 1939. Amer. Midland Nat. 22: 73. ♂.

*Ashmeadiella (Chilosima) Washingtonensis* Michener, 1939. Amer. Midland Nat. 22: 80. ♀.

**ingoensis** Michener. East. Calif., deserts. Pollen: Unknown, but visits flowers of *Dalea polyadenia*, *D. schottii*.

*Ashmeadiella (Corythochila) ingoensis* Michener, 1939. Amer. Midland Nat. 22: 75. ♀, ♂.

**lateralis** Michener. South. Calif.

*Ashmeadiella lateralis* Michener, 1936. Pan-Pacific Ent. 12: 60. ♂.

**leachi** Michener. Calif.

*Ashmeadiella (Arogochila) leachi* Michener, 1949. Kans. Ent. Soc., Jour. 22: 43. ♀.

**lutzi** (Cockerell). Utah, Colo. Pollen: Unknown, but visits flowers of *Phacelia leucophylla*.

*Chelostomopsis lutzii* Cockerell, 1930. Amer. Mus. Novitates 397: 2. ♀.

**micheneri** Snelling. Calif. (Stanislaus and Mariposa counties). Pollen: Unknown, but visits flowers of *Phacelia*.

*Ashmeadiella (Arogochila) micheneri* Snelling, 1962. Pan-Pacific Ent. 38: 231, fig. 2. ♂, ♀.

**neomexicana** (Cockerell). N. Mex.

*Chelostoma Neomexicanum* Cockerell, 1904. Canad. Ent. 36: 13. ♀.

**salviae** Michener. South. and cent. Calif. Pollen: Apparently polylectic, visits flowers of *Brassica*, *Calochortus luteus*, *Dalea*, *Lepechinia calycina*, *Rhamnus crocea*, *Salvia mellifera*, *Trichostema parishii*.

*Ashmeadiella (Arogochila) salviae* Michener, 1939. Amer. Midland Nat. 22: 69. ♀, ♂.

**sculleni** Michener. Oreg.

*Ashmeadiella (Arogochila) sculleni* Michener, 1939. Amer. Midland Nat. 22: 60. ♀.

**stenognatha** Michener. Calif. Pollen: Unknown, but visits flowers of *Phacelia platyloba*.

*Ashmeadiella (Arogochila) stenognatha* Michener, 1939. Amer. Midland Nat. 22: 63. ♀.

Taxonomy: Michener, 1954. Kans. Ent. Soc., Jour. 27: 77. ♂.

**timberlakei solida** Michener. Cent. and north. Calif., Oreg., Nev. Pollen: Apparently polylectic, visits flowers of *Astragalus bolanderi*, *Eriodictyon*, *Grindelia camporum*, *Kelloggia galioides*, *Lotus argophyllus*, *L. glaber*, *L. nevadensis*, *L. scoparius*, *Nama rothrockii*, *Nemophila*, *Phacelia distans*, *Solidago californica*, *Trifolium variegata*.

*Ashmeadiella (Arogochila) timberlakei solida* Michener, 1939. Amer. Midland Nat. 22: 68. ♂, ♀.

**timberlakei timberlakei** Michener. South. Calif. Parasite: *Anthrax irroratus* Say, *Leucospis affinis* Say, *Nemognatha nigripennis* LeC., *Rhydiniofoenus* sp., *Stelis* sp. Pollen: Apparently polylectic, visits flowers of *Chaenactis*, *Chorizanthe staticoides*, *Cryptantha intermedia*, *C. lepida*, *Dalea californica*, *Eriodictyon crassifolium*, *E. trichocalyx*, *Lotus argophyllus*, *L. davidsonii*, *L. glaber*, *L. nevadensis*, *L. scoparius*, *Lupinus arizonicus*, *L. concinnus*, *Mimulus fremontii*, *Oenothera dentata*, *Penstemon spectabilis*, *Phacelia cicutaria*, *P. davidsonii*, *P. heterophylla*, *P. ramosissima*, *Trichostema lanata*, *T. parishii*, *Trifolium variegata*.

*Ashmeadiella timberlakei* Michener, 1936. Pan-Pacific Ent. 12: 56. ♀, ♂.

Genus *ASHMEADIELLA* Subgenus *CUBITOGNATHA* Michener

*Ashmeadiella* subg. *Cubitognatha* Michener, 1939. Amer. Midland Nat. 22: 81.

Type-species: *Ashmeadiella xenomastax* Michener. Orig. desig. and monotypic.

*xenomastax* Michener. South. and east. Calif., Nev.; Mexico (Sonora); deserts. Pollen:

Apparently polylectic, visits flowers of *Aster abatus*, *Chaenactis xantiana*, *Dalea californica*, *D. mollis*, *D. polyadenia*, *D. saundersii*, *D. schottii*, *Eriogonum fasciculatum*, *Lotus*, *Lupinus odoratus*, *Phacelia distans*, *Pholisma arenarium*, *Salvia columbariae*.

*Ashmeadiella (Cubitognatha) xenomastax* Michener, 1939. Amer. Midland Nat. 22: 81. ♀.

Taxonomy: Michener, 1942. Ent. News 53: 51. ♂.

Genus *OSMIA* Panzer

Revision: Sandhouse, 1939. Ent. Soc. Wash., Mem. 1: 1-167 (Nearctic spp.). — Rust, 1974.

Wasmann Jour. Biol. 32: 1-93, 45 figs., 9 tables (treats Nearctic spp. of the subgenera *Cephalosmia*, *Chalcosmia* and *Osmia* and includes information on their biologies).

Taxonomy: Sandhouse, 1924. Calif. Acad. Sci., Proc. (4) 13: 357-364 (key to western spp.).

— Sandhouse, 1925. Canad. Ent. 57: 35-41 (key to Canad. spp.). — Michener, 1941. Amer.

Midland Nat. 26: 147-167 (classification). — Sinha, 1958 (1956). Xth Internatl. Congress

Ent., Proc. 1: 243-251, 1 fig., 4 tables (phylogenetic relationships). — Sinha, 1958. Kans.

Univ. Sci. Bul. 39: 211-261, 151 figs. (reclassification of New World subgenera). — Mitchell,

1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 69-107, figs. 1, 25-35, table 4 (eastern U. S.

spp.). — Snelling, 1967. South. Calif. Acad. Sci., Bul. 66: 103-108, 1 fig. (treats subgenera *Euthosmia* and *Mystacoscemia*).

Biology: Rau, 1937. Ent. Soc. Amer., Ann. 30: 324-343, 6 figs., 2 tables (nesting habits).

— Bohart, 1955. Ent. Soc. Wash., Proc. 57: 203-204 (gradual nest supersedure).

— Crosswhite and Crosswhite, 1966. Amer. Midland Nat. 76: 450-467 (*Penstemon* visiting

spp.). — Krombein, 1967. Trap-nesting wasps and bees, pp. 295-320, pl. 16, figs. 70-77, pl. 17,

figs. 82-85, 87, pl. 18, figs. 88-91, pl. 23, figs. 111-114, pl. 27, figs. 128-130, tables 29-33 (life

histories, nests, associates). — Medler, 1967. Ent. Soc. Amer., Ann. 60: 338-344, figs. 1-2, 2

tables (life histories, nests and associates of Wis. spp.). — Maeta, 1969. The life study,

Fukui 13: 41-43 (supersedure). — Rust, 1974. Wasmann Jour. Biol. 32: 1-93, 45 figs., 9 tables

(life histories, nests and associates of the subgenera *Cephalosmia*, *Chalcosmia* and

*Osmia*).

Genus *OSMIA* Subgenus *OSMIA* Panzer

*Osmia* Panzer, 1806. Krit. Rev. Insektenf. Deutschlands, v. 2, p. 230.

Type-species: *Apis rufa* Linnaeus. Desig. by Latreille, 1810. (= *Apis bicornis* Linnaeus).

*Amblys* Klug, 1807. Mag. Insektenk. 6: 198.

Type-species: *Apis rufa* Linnaeus. Desig. by Latreille, 1810.

*Osmia* subg. *Ceratosmia* Thomson, 1872. Hym. Scand., v. 2, p. 232.

Type-species: *Apis rufa* Linnaeus. Monotypic.

*Osmia* subg. *Aceratosmia* Schmiedeknecht, [1885]. Apidae Europaeae, v. 2, p. 19.

Type-species: *Osmia emarginata* Lepeletier. Desig. by Sandhouse, 1939.

*Osmia* subg. *Pachyosmia* Ducke, 1900. Ber. naturw.-med. Ver. Innsbruck 25: 18.

Type-species: *Osmia rufa* (Linnaeus). Desig. by Sandhouse, 1939.

Revision: Rust, 1974. Wasmann Jour. Biol. 32: 8-32, figs. 1-2, 7-15, tables 1-3 (Nearctic spp.).

Biology: Rust, 1974. Wasmann Jour. Biol. 32: 9-11 (summary of information on life histories).

*cornifrons* (Radoszkowski). Utah (Garden City and Providence Canyon); China, Korea, Japan.

Ecology: Nests in preexisting burrows, holes or cavities in wood, stems or culms including trap-nests. Purposely introduced into Utah from Morioka, Japan in 1965 and possibly is an established species. Parasite: *Tricrania stansburyi* (Hald.). Pollen:

Apparently polylectic, visits flowers of *Malus*, *Prunus*, *Pyrus*.

*Chalicodoma cornifrons* Radoszkowski, 1887. Soc. Ent. Ross., Horae 21: 430. ♀.

Biology: Rust, 1974. Wasmann Jour. Biol. 32: 14-15 (nest architecture, cocoon, life history, parasite).

*lignaria lignaria* Say. N. S. to Ga., west to Mich., Iowa, Nebr., Kans., Okla., and Tex. Ecology: Nests in a wide variety of preexisting borings, burrows, cavities, crevices, and mud nests of wasps as well as attaching their cells in clusters on exposed surfaces; uses mud for nest construction. Parasite: *Chaetodactylus krombeini* Baker, *Chrysura kyrae* Krombein, *Leucospis affinis* Say, *Melittobia chalybii* Ashm., *Monodontomerus obscurus* Westw., *Sapyga angustata* Cress. Pollen: Polylectic, visits a wide variety of flowers including *Camassia*, *Cardamine*, *Cercis canadensis*, *Chaerophyllum*, *Claytonia*, *Collinsia*, *Dentaria laciniata*, *Dicentra*, *Diervilla japonica*, *Dirca*, *Eriogonum*, *Erythronium albidum*, *E. americanum*, *Fragaria*, *Geranium*, *Glechoma hederacea*, *Hydrophyllum*, *Lupinus*, *Malus*, *Mertensia*, *Nepeta hederacea*, *Osmorrhiza*, *Oxalis*, *Polemonium*, *Prunus*, *Pyrus*, *Ranunculus*, *Ribes*, *Rosa*, *Rubus*, *Salix*, *Senecio*, *Stellaria*, *Taenidia*, *Taraxacum*, *Viburnum*, *Vicia*, *Viola*, *Zanthoxylum*.

*Osmia lignaria* Say, 1837. Boston Jour. Nat. Hist. 1: 399. ♀, ♂.

*Osmia purpurascens* Smith, 1849. Zoologist 7 (app.): lviii. ♂.

Biology: Rau, 1926. Acad. Sci. St. Louis, Trans. 25: 203 (nest). — Rau, 1937. Ent. Soc. Amer., Ann. 30: 324-342, 1 pl. (nest architecture, life history, effect of cell size and placement on sex ratio, foraging behavior, parasite). — Bohart, 1955. Ent. Soc. Wash., Proc. 57: 203-204 (nest architecture, life history, supersedure). — Chandler, 1959 (1958). Ind. Acad. Sci., Proc. 68: 199-204 (nest). — Balduf, 1961. Brooklyn Ent. Soc., Bul. 56: 83-84 (nest, foraging behavior). — Krombein, 1962. Biol. Soc. Wash., Proc. 75: 239-242, pl. 1 (nest architecture, parasite). — Chandler, 1962. Ent. Soc. Amer., North Central Branch, Proc. 16: 18-19 (nest architecture, life history, parasite). — Krombein, 1967. Trap-nesting wasps and bees, pp. 296-306; pl. 16, figs. 70-77; pl. 17, figs. 82-85, 87; pl. 18, fig. 88; pl. 23, figs. 111-114; pl. 27, figs. 128-130 (nest architecture, life history, supersedure, effect of cell size and placement on sex ratio, foraging behavior, cocoon, parasites). — Medler, 1967. Ent. Soc. Amer., Ann. 60: 340-341, fig. 2, table 1 (nest architecture, life history). — Byers, 1972. Kans. Ent. Soc., Jour. 45: 235-238 (supersedure by *Monobia quadridens*). — Matthews and Kislow, 1973. Environ. Ent. 2: 157-158, 1 fig. (cocoon orientation). — Rust, 1974. Wasmann Jour. Biol. 32: 21-27, table 3 (nest architecture, life history, parasites). — Torchio, 1976. Kans. Ent. Soc., Jour. 49: 475-482, 4 figs., 4 tables (use as pollinator in apple and prune orchards).

*lignaria propinqua* Cresson. Sask., to west. Tex., west to B. C., Wash., Oreg. and Calif.

Ecology: Nests in a wide variety of preexisting borings, burrows, cavities, crevices and mud nests of wasps as well as attaching their cells in clusters on exposed surfaces; uses mud for nest construction. Parasite: *Leucospis affinis* Say, *Sapyga emarginata* Cress., *Stelis* sp., *Tricrania stansburyi* Hald. Pollen: Polylectic, visits a wide variety of flowers including *Acer*, *Amsinckia intermedia*, *Arbutus menziesii*, *Arctostaphylos drupacea*, *A. glauca*, *A. patula*, *Astragalus*, *Berberis californica*, *Blennosperma nanum*, *Brassica*, *Ceanothus integerrimus*, *Cercis occidentalis*, *Cercocarpus betulifolius*, *Cirsium*, *Clarkia*, *Collinsia heterophylla*, *Cryptantha*, *Cytisus scoparius*, *Eriodictyon*, *Erythronium*, *Geranium canescens*, *Gilia tricolor*, *Hydrophyllum*, *Isomeris arborea*, *Limnanthus douglasii*, *Lonicera*, *Lupinus albifrons*, *L. bicolor*, *Lyrium*, *Minulus*, *Nemophila exilis*, *N. menziesii*, *Penstemon*, *Phacelia cicutaria*, *P. distans*, *P. tanacetifolia*, *Prunus subcordata*, *Ranunculus californicus*, *Raphanus sativus*, *Rhamnus californica*, *R. erocaea*, *Ribes cereum*, *R. menziesii*, *R. roezlii*, *R. velutina*, *R. viscosissimum*, *Rubus ursinus*, *Salix laevigata*, *S. lasiolepis*, *Salvia carduacea*, *Senecio*, *Sisymbrium irio*, *Tamarix*, *Taraxacum vulgare*, *Trifolium repens*, *Vicia californicum*, *Viola*, *Ysotia*. Predator: *Ptinus californicus* Pic., *Trichodes ornatus* Say.

*Osmia propinqua* Cresson, 1864. Ent. Soc. Phila., Proc. 3: 23. ♀.

*Osmia lignaria lignariella* Cockerell, 1906. Ann. and Mag. Nat. Hist. (7) 17: 227. ♀.

Taxonomy: Michener, 1953. Kans. Univ. Sci. Bul. 35: 1054, figs. 135-137, 140 (larva).

Biology: Hicks, 1934. Colo. Univ., Studies 21: 265 (nest). — Linsley and MacSwain, 1941. South. Calif. Acad. Sci., Bul. 40: 129 (nest, parasites). — Levin, 1957. Econ. Ent., Jour. 50: 506-507 (nest architecture, life history). — Levin and Haydak, 1957. Bee World 38: 221-226 (comparative nutritional values of different pollens). — Levin, 1966. Kans. Ent. Soc., Jour.

39: 524-535, figs 2-6 (nest architecture, life history, cocoon, effect of cell size and placement on sex ratio, mud collecting, foraging behavior, parasites, predators). —Rust, 1974. Wasmann Jour. Biol. 32: 21-27, table 3 (nest architecture, life history, mating behavior, parasites, predators).

**ribifloris biedermannii** Michener. Oreg., Calif., Nev., Utah, Ariz., west. N. Mex.; Mexico (Baja California). Ecology: Nests in borings, abandoned *Sceliphron* nests and between cracks in shingles. Pollen: Polylectic, visits flowers of *Arctostaphylos drupacea*, *A. glandulosa*, *A. glauca*, *A. patula*, *Asclepias*, *Astragalus*, *Berberis*, *Eriodictyon crassifolium*, *Fendlera*, *Phlox*, *Prunus*, *Rhus*, *Ribes*, *Salix*, *Salvia sonomensis*, *Wyethia*.  
*Osmia ribifloris biedermannii* Michener, 1936. Amer. Mus. Novitates 875: 19. ♀, ♂.

Biology: Leech, 1959. Pan-Pacific Ent. 35: 53 (nest). —Krombein, 1967. Trap-nesting wasps and bees, p. 306 (nest architecture, life history, as *ribifloris*). —Rust, 1974. Wasmann Jour. Biol. 32: 32 (nest architecture, foraging behavior).

**ribifloris ribifloris** Cockerell. Tex., N. Mex., Colo., Utah, Nev. Pollen: Unknown, but visits flowers of *Berberis*, *Sophora*.

*Osmia (Melanosmia) ribifloris* Cockerell, 1900. Ann. and Mag. Nat. Hist. (7) 5: 410. ♀.

### Genus OSMIA Subgenus CHALCOSMIA Schmiedeknecht

*Osmia* Subg. *Chalcosmia* Schmiedeknecht, [1885]. Apidae Europaeae, v. 2, p. 886.

Type-species: *Osmia fulviventris* Latreille. Desig. by Sandhouse, 1939.

*Gnathosmia* Robertson, 1903. Amer. Ent. Soc., Trans. 29: 165.

Type-species: *Osmia georgica* Cresson. Orig. desig. and monotypic.

Revision: Rust, 1974. Wasmann Jour. Biol. 32: 32-56, figs. 3-4, 15-26, tables 4-6.

Biology: Rust, 1974. Wasmann Jour. Biol. 32: 34 (summary of information on life histories).

**chalybea** Smith. N. J., N. C., Ga., Fla., La., Tex. Pollen: Unknown, but visits flowers of *Ceanothus*, *Cirsium*, *Vaccinium*.

*Osmia chalybea* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 143. ♀, ♂.

Taxonomy: Cockerell, 1905. Amer. Ent. Soc., Trans. 31: 33. ♂.

**coerulescens** (Linnaeus): Holarctic. N. S. to Minn. south to N. C., Ind., Ill., Mo., and Neb.;

Idaho (Twin Falls), where probably adventive. Ecology: Nests in preexisting burrows in

wood or in open cavities as in old mud dauber nests. Parasite: *Melittobia chalybii*

Ashm., *Monodontomerus* sp. Pollen: Collects pollen from *Leonurus cardineus*, *Medicago*

*sativa*, *Nepeta cataria*, but visits other flowers including *Agastache*, *Cercis*, *Cirsium*,

*Lotus*, *Philadelphus*, *Salvia*, *Trifolium*, *Vicia*. Predator: *Attageus piceus* Oliv.,

*Chaetodactylus* sp., *Trogoderma inclusum* LeC., *T. teukton* Beal.

*Apis coerulescens* Linnaeus, 1758. Syst. Nat., ed. 10, p. 576. ♀.

*Apis aenea* Linnaeus, 1761. Fauna Suecica, ed. 2, p. 421. ♂.

*Osmia cyanea* Giraud, 1866. Soc. Ent. France, Ann. 6: 451. ♀, ♂.

*Osmia purpurea* Cresson, 1864. Ent. Soc. Phila., Proc. 3: 27. ♀.

*Osmia rustica* Cresson, 1864. Ent. Soc. Phila., Proc. 3: 27. ♂.

*Osmia caerulescens* Dalla Torre, 1896. Cat. Hym., v. 10, p. 388. Emend.

Biology: Chandler, 1963. North Central Branch, Ent. Soc. Amer., Proc. 18: 30 (nest, predators, parasites). —Krombein, 1967. Trap-nesting wasps and bees, pp. 310-311 (nest architecture, life history, predator). —Medler, 1967. Ent. Soc. Amer., Ann. 60: 341, table 1 (nest architecture). —Tasei, 1972. Apidologie 3: 149-165 (nest architecture, life history, parasites). —Rust, 1974. Wasmann Jour. Biol. 32: 42 (life history, predators, parasites).

**coloradensis** Cresson. Nebr. to Tex., west to B. C., Wash., Oreg. and Calif.; Mex. (Baja California). Ecology: Nests in burrow in *Pinus jeffreyi* cone as well as trap-nests. Parasite: *Chrysura pacifica* (Say). Pollen: Apparently prefers pollen from the flowers of Compositae, but also visits other flowers possibly for nesting material; visitation records include *Amsinckia intermedia*, *Barbarea orthoceras*, *Calandrinia caulescens* var. *menziesii*, *Calendula*, *Carduus tenuiflorus*, *Centaurea*, *Chaenactis fremontii*, *C. glaberrimula*, *Chrysothamnus*, *Cirsium californicum*, *Coreopsis lanceolata*, *Cryptantha intermedia*, *Encelia farinosa*, *Erigeron*, *Eriodictyon*, *Eriogonum nudum*, *Eriophyllum*

*confertiflorum*, *E. lanatum*, *Eucnide*, *Gilia multicaulis*, *Grindelia camporum*, *Gutierrezia*, *Helenium bigelovii*, *Helianthella californica*, *Helianthus gracilentus*, *Hyptis emoryi*, *Iris*, *Lasthenia chrysostoma*, *Layia platyglossa* var. *breviseta*, *Malacothrix*, *Mimulus guttatus*, *Penstemon*, *Phacelia minor*, *Phalacoseris bolanderi*, *Ranunculus californicus*, *Rhus trilobata*, *Senecio integerrimus*, *S. lugens*, *Silybum marianum*, *Sisymbrium irio*, *Sonchus oleraceus*, *Sphaeralcea ambigua*, *Stenotopsis linearifolius*, *Taraxacum officinale*, *Verbena*, *Viguiera laciniata*, *Wyethia*.

*Osmia coloradensis* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 105. ♀.

*Osmia hypochrysea* Cockerell, 1906. Amer. Mus. Nat. Hist., Bul. 22: 449. ♀.

*Osmia hypochrysea Rohweri* Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 19: 366. ♀.

*Osmia pasadenae* Cockerell, 1910. Ent. News 21: 122. ♂.

Biology: Ruckes, 1956. Pan-Pacific Ent. 32: 122, 1 fig. — Rust, 1974. Wasmann Jour. Biol. 32: 47-48 (pest architecture, cocoon, parasite).

**georgica** Cresson. Mass. to Mich., south to Fla. and Tex. Ecology: Nests in borings and glass tubes. Parasite: *Chrysura pacifica* (Say). Pollen: Unknown, but visits flowers of *Aronia*, *Brassica*, *Cardamine*, *Chrysanthemum leucanthemum*, *Claytonia*, *Coreopsis*, *Erigeron*, *Erythronium*, *Fragaria*, *Geranium*, *Hydrangea*, *Krigia*, *Linaria*, *Lupinus*, *Malus*, *Pyrus*, *Ranunculus*, *Rubus*, *Salix*, *Senecio*, *Taraxacum*, *Verbena*, *Vicia*. Predator: *Camponotus* sp., *Crematogaster* sp.

*Osmia georgica* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 105. ♀.

*Osmia (Gnathosmia) louisianae* Cockerell, 1901. Canad. Ent. 42: 171. ♀.

Biology: Hartman, 1944. Psyche, 51: 162-165 (nest architecture, life history). — Krombein, 1967. Trap-nesting wasps and bees. p. 311 (nest architecture, life history). — Hawkins, 1975. Kans. Ent. Soc., Jour. 48: 493-499, 3 figs. (nest architecture, life history, parasite, predator).

**texana** Cresson. N. Y., Mich., Ohio, Nebr., Tex., and B. C., Alta. and N. Dak., south to N. Mex., Ariz. and Calif. Mexico (Baja California and Tamaulipas). Ecology: Nests in abandoned cells of *Anthophora occidentalis* Cr. in clay bank and in elderberry trap-nests; uses masticated leaf material from *Malva neglecta* and *Sphaeralcea coccinea* for cell partitions and cell plug. Parasite: *Anthrax irroratus* Say, *Chrysis densa* Cress., *Hornia minutipennis* Riley, *Monodontomerus montivagus* Ashm., *Nemognatha* sp., *Stelis montana* Cress. Pollen: Apparently prefers pollen from Compositae, visits a wide variety of flowers including *Asclepias*, *Campanula*, *Carduus tenuiflorus*, *Calochortus splendens*, *Centaurea*, *Chaenactis glabriuscula*, *Cirsium californicum*, *C. vulgare*, *Coreopsis lanceolata*, *Cryptantha intermedia*, *Diplacus aurantiacus*, *Erigeron*, *Eriodictyon californicum*, *Eriophyllum lanatum*, *Grindelia camporum*, *Frasera parryi*, *Helianthus*, *Lotus*, *Marrubium vulgare*, *Monarda*, *Monardella villosa*, *Parkinsonia aculeata*, *Penstemon*, *Phalacoseris bolanderi*, *Rubus leucodermis*, *Senecio*, *Stenotopsis linearifolius*, *Sidalcea malvaeflora*, *Viguiera laciniata*, *V. multiflora*, *Wyethia helenioides*. Predator: *Trichodes simulator* (Horn).

*Osmia texana* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 261. ♂.

*Osmia mandibularis* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 102. ♀.

*Osmia faceta* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 103. ♂.

*Osmia davidsoniella* Cockerell, 1905. Canad. Ent. 37: 370. ♂.

Biology: Hicks, 1926. Colo. Univ., Studies 15: 217 (nest). — Mickel, 1928. Ent. News 39: 69 (nest). — Hobbs, Nummi and Virotek, 1961. Canad. Ent. 93: 143 (nest, parasite). — Rust, 1974. Wasmann Jour. Biol. 32: 54-56 (nest architecture, life history, parasites).

#### Genus OSMIA Subgenus CEPHALOSMIA Sladen

*Cephalosmia* Sladen, 1916. Canad. Ent. 48: 270.

Type-species: *Osmia montana* Cresson. Monotypic. (= *Osmia armaticeps* Cresson).

Revision: Rust, 1974. Wasmann Jour. Biol. 32: 56-85, figs. 5-6, 27-45, tables 7-9.

Biology: Rust, 1974. Wasmann Jour. Biol. 32: 58 (summary of information on life histories).

**californica** Cresson. B. C. to Calif., east to Mont., Wyo. and Colo. Ecology: Nests in borings and preexisting burrows in various wood substrates. Parasite: *Anthrax* sp., *Chrysids* sp., *Leucospis affinis* Say, *Nemognatha* sp., *Stelis* sp., *Tricrania stansburyi* Hald. Pollen: Apparently mainly dependent upon the pollens of Compositae, especially *Cirsium*, but visits many flowers including *Amsinckia*, *Arnica*, *Balsamorhiza*, *Brodiaea lutea*, *Calochortus*, *Carduus tenuiflorus*, *Ceanothus*, *Chaenactis glabriuscula*, *Cirsium californicum*, *C. proteanum*, *Clarkia*, *Cryptantha intermedia*, *Erigeron pygmaeus*, *Eriodictyon californicum*, *Eriogonum*, *Eriophyllum lanatum*, *Gilia capitata*, *Grindelia camporum*, *Helianthus nuttallii*, *Layia platyglossa*, *Lotus strigosus* var. *hirtellus*, *Lupinus*, *Mimulus guttatus*, *Penstemon*, *Phacelia heterophylla*, *P. humilis*, *Physocarpus*, *Ranunculus*, *Salix*, *Senecio integerrimus*, *Sidalcea*, *Stenotopsis linearifolius*, *Taraxacum officinale*, *Viguiera multiflora*, *Wyethia angustifolia*, *W. elata*, *W. glabra*, *W. helenioides*, *W. longicaulis*, *W. mollis*, *W. ovata*, *W. reticulata*. Predator: *Ptinis californicus* Pic, *Trichodes ornatus* Say.

*Osmia californica* Cresson, 1864. Ent. Soc. Phila., Proc. 3: 24. ♀.

*Osmia pascoensis* Cockerell, 1897. Acad. Nat. Sci. Phila., Proc. 49: 342. ♀.

*Osmia nassa* Cockerell, 1910. Ent. News 21: 272. ♀.

*Osmia occidentalis* Michener, 1936. Canad. Ent. 68: 42. ♀.

Biology: Bohart, 1955. Ent. Soc. Wash., Proc. 57: 203-204 (nest, supersedure). — Levin, 1966. Kans. Ent. Soc. Jour. 39: 524-535, 6 figs., 3 tables (nest architecture, life history, supersedure, sex relationships, pollen collection, parasites). — Rust, 1974. Wasmann Jour. Biol. 32: 66-69 (nest architecture, life history, parasites).

**grinnelli** Cockerell. Calif., Nev., Utah, Idaho. Pollen: Unknown, but visits flowers of *Arctostaphylos drupacea*, *A. patula*, *Aster abatus*, *Astragalus pachypus*, *Chaenactis glabriuscula*, *Coreopsis lanceolata*, *Cryptantha intermedia*, *Descurainia sophia*, *Encelia actoni*, *E. frutescens*, *Erysimum*, *Helianthus gracilentus*, *Hesperochiron californicum*, *Hulsea callicarpa*, *Lupinus*, *Nepeta*, *Penstemon*, *Prunus subcordata*, *Sisymbrium*, *Stenotopsis linearifolius*, *Taraxacum*, *Wyethia*.

*Osmia grinnelli* Cockerell, 1910. Ent. News 21: 120. ♀.

**marginipennis** Cresson. Calif., Nev., Oreg., Idaho, Utah, Colo., Wyo.; Mexico (Baja California).

Pollen: Unknown, but visits flowers of *Chaenactis*.

*Osmia marginipennis* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 106. ♂.

*Osmia gaillardiae* Cockerell, 1906. Ann. and Mag. Nat. Hist. (7) 17: 227. ♀.

*Osmia viridior* Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 19: 261. ♂.

*Osmia leonis* Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 20: 123. ♀.

**montana montana** Cresson. B. C. to Calif. (White Mts.), east to Idaho and Mont., south to Ariz. and N. Mex. Ecology: Nests in trap-nests. Parasite: *Stelis montana* Cress. Pollen: Analyzed pollen stores indicates reliance on Compositae including *Balsamorhiza sagittata*, *Cosmos*, *Helianthus annuus*, *Wyethia amplexicaulis*, but also visits other flowers for nectar or pollen including *Arnica*, *Aster*, *Chaenactis*, *Gutierrezia*, *Senecio*, *Silybum*, *Taraxacum*.

*Osmia montana* Cresson, 1864. Ent. Soc. Phila., Proc. 3: 24. ♂.

*Osmia arnateiceps* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 104. ♀.

*Osmia arnateiceps* var. *sapellonis* Cockerell, 1901. Ann. and Mag. Nat. Hist. (7) 7: 336. ♀.

Biology: Rust, 1974. Wasmann Jour. Biol. 32: 76-80 (nest architecture, life history, supersedure, parasite).

**montana quadriceps** Cresson. Wash. to Calif., Nev., Ariz. (Santa Catalina Mts.). Ecology:

Nests in abandoned beetle burrows in *Pinus contorta*. Pollen: Apparently polylectic, although most floral records from noncomposite genera refer to visits for leaf or dried flower material; visitation records include *Agoscris heterophylla*, *Arctostaphylos patula*, *Aster*, *Astragalus*, *Balsamorhiza deltoidea*, *Ceanothus integerrimus*, *Chaenactis glabriuscula*, *Cirsium*, *Clarkia biloba*, *Coreopsis*, *Eriodictyon*, *Eriophyllum confertiflorum*, *E. lanatum*, *Gilia capitata*, *Gormania obtusata*, *Haplopappus linearifolius*, *Helianthella californica*, *Helianthus gracilentus*, *Hesperochiron californicus*, *Lasthenia chrysostoma*, *Layia platyglossa*, *Lotus scoparius*, *Lupinus*, *Mimulus suksdorfii*, *Nemophila integrifolia*, *Penstemon*, *Phacelia humilis*, *Potentilla*,

*Raillardella scaposa*, *Ribes cereum*, *Salvia*, *Senecio*, *Sidalcea*, *Sisymbrium irio*, *Tamarix gallica*, *Taraxacum officinale*, *Wyethia angustifolia*, *W. helenioides*, *W. mollis*.

*Osmia quadriceps* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 104. ♀.

Biology: Rust, 1974. Wasmann Jour. Biol. 32: 81 (nest).

**subaustralis** Cockerell. N. W. T. east to Ont. and Mich., south to Calif., Nev., Ariz. and N. Mex.

Ecology: Nests in abandoned beetle burrows in fir log, probably *Abies lasiocarpa*.

Pollen: Analyzed pollen stores revealed 99 per cent from Compositae, probably *Senecio*; visits flowers of *Aster*, *Centaurea*, *Encelia farinosa*, *Erigeron*, *Gutierrezia*, *Lupinus*, *Penstemon*, *Phacelia humilis*, *Raillardella scaposa*, *Senecio*, *Solidago*, *Streptanthus*, *Taraxacum*, *Wyethia*, *Yucca*.

*Osmia nigrifrons* var. *subaustralis* Cockerell, 1900. Ann. and Mag. Nat. Hist. (7) 5: 410. ♀.

*Osmia wardiana* Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 19: 368. ♀.

*Osmia seneciophila* Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 20: 446. ♂.

*Osmia nelsoni* Cockerell, 1930. Ann. and Mag. Nat. Hist. (10) 5: 411. ♀.

*Osmia wardiana austromontana* Michener, 1936. Canad. Ent. 68: 42. ♀.

*Osmia lynceis* Cockerell, 1937. South. Calif. Acad. Sci., Bul. 36: 110. ♀.

*Osmia (Cephalosmia) mendocinensis* Sandhouse, 1939. Ent. Soc. Wash., Mem. 1: 27. ♀.

Biology: Rust, 1974. Wasmann Jour. Biol. 32: 85 (nest architecture, pollen).

### Genus OSMIA Subgenus CENTROSMIA Robertson

*Centrosmia* Robertson, 1903. Amer. Ent. Soc., Trans. 29: 165.

Type-species: *Osmia bucephala* Cresson. Orig. desig. and monotypic.

Revision: Sinha and Michener, 1958. Kans. Univ. Sci. Bul. 39: 275-303 (Nearctic spp.).

**austromaritima** Michener. Calif., Colo., Utah.

*Osmia austromaritima* Michener, 1936. Canad. Ent. 68: 43. ♂.

**bakeri** Sandhouse. Oreg., Calif. Pollen: Unknown, but visits flowers of *Clarkia*, *Collinsia chiddii*, *C. heterophylla*, *C. wrightii*, *Cryptantha lepida*, *Gilia tricolor*, *Nemophila integrifolia*.

*Osmia bakeri* Sandhouse, 1924. Calif. Acad. Sci., Proc. (4) 13: 345. ♂.

**bucephala** Cresson. Holarctic; Alaska, Yukon and N. W. T. to Que., south to Calif., Utah, N. Mex., Ill., Tenn., and N. C.; limited to mountains in southern part of range. Ecology:

Nests in borings and in a tunnel in a maple tree. Parasite: *Chaetodactylus krombeini* Baker, *Melittobia chalybii* Ashm. Pollen: Unknown, but visits flowers of *Aesculus*, *Azalea*, *Baptisia*, *Cercis canadensis*, *Dentaria*, *Dicentra*, *Erythronium*, *Mertensia virginica*, *Nepeta hederacea*, *Penstemon*, *Taraxacum*, *Tephrosia virginiana*, *Viola*.

*Osmia bucephala* Cresson, 1864. Ent. Soc. Phila., Proc. 3: 17. ♀.

*Osmia megacephala* Cresson, 1864. Ent. Soc. Phila., Proc. 3: 18. ♀.

*Osmia latitarsis* Cresson, 1864. Ent. Soc. Phila., Proc. 3: 20. ♂.

*Osmia lignivora* Packard, 1867. Amer. Nat. 1: 375. ♀.

*Osmia lignicola* Provancher, 1882. Nat. Canad. 13: 208. ♀.

*Osmia subornata* Cockerell, 1897. Acad. Nat. Sci. Phila., Proc. 49: 342. ♀.

Biology: Packard, 1867. Amer. nat. 1: 375 (nest, as *lignivora*). —Krombein, 1967.

Trap-nesting wasps and bees, pp. 307-310, pl. 18, figs. 89-91 (nest architecture, life history, supersedure, parasites).

**nigriventris** (Zetterstedt). Holarctic; Alaska to Hudson Bay and Ont., south to Oreg., Colo. and Minn.; Eurasia.

*Anthophora nigriventris* Zetterstedt, 1838. Ins. Lapponica, v. 1, p. 465. ♀.

*Osmia frigida* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 142. ♀, ♂.

*Osmia hudsonica* Cresson, 1864. Ent. Soc. Phila., Proc. 3: 21. ♂.

*Osmia corticalis* Gerstaecker, 1869. Stettin. Ent. Ztg. 30: 331. ♀, ♂.

Taxonomy: Cockerell, 1905. Amer. Ent. Soc., Trans. 31: 331. ♀, ♂. —Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 77-78, fig. 33, table 4 (redescription, synonymy).



- pikei** Cockerell. B. C., Wash., Oreg., Nev., Calif., Colo., Wyo. Parasite: *Nemognatha scutellaris* LeC., *Sapyga fulvicornis* Cress. Pollen: Unknown, but visits flowers of *Ribes cereum*.  
*Osmia pikei* Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 19: 367. ♀.  
*Osmia universitatis* Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 19: 538. ♂.  
*Osmia integrella* Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 20: 124. ♂.  
*Osmia vallicola* Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 20: 449. ♂.  
*Osmia amala* Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 20: 447. ♂.  
*Osmia metitia* Cockerell, 1909. Canad. Ent. 41: 130. ♂.
- raritatis** Michener. Colo., Wash., Calif.  
*Osmia raritatis* Michener, 1957. Kans. Ent. Soc., Jour. 30: 40, figs. 1, 3, 5. ♂.
- tanneri** Sandhouse. Utah. Ecology: Nests made entirely of mud on concave underside of stone.  
 Parasite: *Chrysura pacifica* (Say). Pollen: Traces of pollen attached to cocoon and exines in feces in cell indicate an unknown species of Umbelliferae.  
*Osmia* (*Nothosmia*) *tanneri* Sandhouse, 1939. Ent. Soc. Wash., Mem. 1: 87. ♂.
- Taxonomy: Parker, 1975. Pan-Pacific Ent. 51: 179-180, figs. 1-2. ♀.
- Biology: Parker, 1975. Pan-Pacific Ent. 51: 180-182, figs. 3-4 (nest architecture, larval habits, life history, parasite).
- tarsata** Provancher. Que.  
*Osmia tarsata* Provancher, 1888. Addit. Corr. Faune Ent. Canada, Hym., p. 328. ♂.
- Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 78-79 (redescription, tax. status).
- thysanisca** Michener. Calif., Oreg., Wyo. Pollen: Unknown, but visits flowers of *Hackelia jessicae*, *Trifolium*.  
*Osmia thysanisca* Michener, 1957. Kans. Ent. Soc., Jour. 30: 39, fig. 2. ♂.
- vandykei** Sandhouse. Oreg.  
*Osmia vandykei* Sandhouse, 1924. Calif. Acad. Sci., Proc. (4) 13: 344. ♂.

#### Genus OSMIA Subgenus ACANTHOSMIOIDES Ashmead

- Acanthosmioides* Ashmead, 1899. Amer. Ent. Soc., Trans. 26: 76.  
 Type-species: *Osmia odontogaster* Cockerell. Orig. design. and monotypic.
- Revision: White, 1952. Kans. Univ. Sci. Bul. 35: 219-307, pls. 39-44 (Nearctic spp.).
- Taxonomy: Michener, 1936. Amer. Mus. Novitates 875: 27-28 (Key).
- ashmeadii** (Titus). Oreg. (Dalles).  
*Acanthosmioides ashmeadii* Titus, 1904. Ent. Soc. Wash., Proc. 6: 101. ♂.
- calcarata** White. Calif. (Sierra Nevada Mts.). Pollen: Unknown, but visits flowers of *Astragalus*, *Lotus*.  
*Osmia calcarata* White, 1952. Kans. Univ. Sci. Bul. 35: 245, pl. 39, fig. 15; pl. 40, fig. 11; pl. 41, fig. 9; pl. 42, fig. 9; pl. 43, fig. 11; pl. 44, fig. 15. ♂, ♀.
- dakotensis** Michener. N. Dak., Mont., east. Colo., Wyo.  
*Osmia dakotensis* Michener, 1937. Ann. and Mag. Nat. Hist. (10) 19: 407. ♀.  
*Osmia* (†*Acanthosmioides*) *dacotensis* Sandhouse, 1939. Ent. Soc. Wash., Mem. 1: 62. Emend.
- franciscois** White. Calif. (San Francisco). Ecology: Collected in sand dunes.  
*Osmia franciscois* White, 1952. Kans. Univ. Sci. Bul. 35: 269, pl. 40, fig. 2. ♀.
- giffardi** Sandhouse. Calif. (Sierra Nevada Mts.).  
*Osmia* (*Acanthosmioides*) *giffardi* Sandhouse, 1939. Ent. Soc. Wash., Mem. 1: 50. ♂.
- giliarum** Cockerell. Idaho, Mont., Wyo., Colo. Pollen: Unknown, but visits flowers of *Gilia*, *Penstemon*.  
*Osmia giliarum* Cockerell, 1906. Amer. Mus. Nat. Hist., Bul. 22: 451. ♀.
- hurdi** White. Calif., B. C. Pollen: Unknown, but visits flowers of *Allium*.  
*Osmia hurdi* White, 1952. Kans. Univ. Sci. Bul. 35: 273, pl. 39, fig. 7. ♀.

**integra** Cresson. Calif. to B. C., east to Man., south to Ariz., N. Mex., Tex., Mich. Pollen: Unknown, but visits flowers of *Astragalus pomonensis*, *Lotus scoparius*, *Phacelia distans*.

*Osmia integra* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 106. ♂.

*Osmia novomexicana* Cockerell, 1903. Ent. News 14: 331. ♀.

*Osmia florissanticola* Cockerell, 1906. Amer. Mus. Nat. Hist., Bul. 22: 450. ♀.

*Osmia integra nigrigena* Michener, 1936. South. Calif. Acad. Sci., Bul. 35: 90. ♂, ♀.

Taxonomy: Cockerell, 1910. Ent. News 21: 270. ♂.

Biology: Hicks, 1926. Colo. Univ., Studies 15: 246 (nesting habits, as *novomexicana*).

**kenoyeri** Cockerell. Yukon, Alta., Calif., Colo.

*Osmia kenoyeri* Cockerell, 1915. Ann. and Mag. Nat. Hist. (8) 16: 483. ♂, ♀.

**lanei** Sandhouse. Calif.

*Osmia (Acanthosmioides) lanei* Sandhouse, 1939. Ent. Soc. Wash., Mem. 1: 51. ♂.

**longula** Cresson. B. C. to Calif., east to Mont., Wyo., Colo. and Utah. Ecology: Nests on side of stone beneath a slight overhang. Pollen: Stores pollen of an unidentified Leguminosae; visits flowers of *Astragalus*, *Erigeron compositus*, *Penstemon heterodoxus*, *Wyethia mollis*.

*Osmia longula* Cresson, 1864. Ent. Soc. Phila., Proc. 3: 19. ♀.

*Osmia abnormis* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 105. ♂.

*Osmia grandior* Cockerell, 1897. Acad. Nat. Sci. Phila., Proc. 49: 343. ♀.

*Osmia permorata* Cockerell, 1910. Canad. Ent. 42: 310. ♀.

Biology: Parker, 1975. Pan-Pacific Ent. 51: 182-183, figs. 5-6 (nest architecture, larval habits, sex ratio, nest provisions).

**nifoata** Cockerell. Wash. to Calif., east to Idaho, Utah, Colo. and Wyo. Parasite: *Dioxya pomonae* Ckll. Pollen: Unknown, but visits flowers of *Amsinckia*, *Astragalus pomonensis*, *Chaenactis*, *Lotus argophyllus*, *L. crassifolius*, *L. davidsonii*, *L. glaber*, *L. scoparius*, *L. strigosus*, *Lupinus confertus*, *L. formosus*, *L. lobbii* var. *lyallii*, *L. odoratus*, *Potentilla glandulosa*, *Rhus trilobata*, *Streptanthus bernardinus*, *Trifolium involucreatum*, *T. variegatum*.

*Osmia (Acanthosmioides) nifoata* Cockerell, 1909. Entomologist 42: 95. ♂.

*Osmia pellax* Sandhouse, 1924. Calif. Acad. Sci., Proc. (4) 13: 356. ♀.

*Osmia (Acanthosmioides) wyomingensis* Michener, 1936. Amer. Mus. Novitates 875: 27. ♂.

Biology: Fulton and Bergen, 1935. Econ. Ent., Jour. 28: 729 (nest). —Hurd, 1958. Calif. Univ. Pubs. Ent. 14: 285 (parasite).

**nigrifrons** Cresson. N. Dak. and Alta., west to B. C., south to Calif., Utah, Colo. and Wyo.

Ecology: Nest in borings, bamboo culms, and in corrugated steel drain pipes. Parasite: *Chrysura pacifica* (Say), *Dibrachys* sp., *Monodontomerus montivagus* Ashm., *Stelis chlorocyanea* Ckll. Pollen: Polylectic, apparently prefers flowers of Leguminosae for pollen and nectar; visits other flowers for pollen including *Astragalus*, *Lotus*, *Onobrychis*, *Trifolium*, *Vicia*; visitation records include *Amsinckia douglasiana*, *Astragalus douglasiana*, *A. parishii*, *A. utahensis*, *Brassica nigra*, *Lotus crassifolius*, *L. davidsonii*, *L. humistratus*, *L. scoparius*, *Medicago sativa*, *Melilotus alba*, *M. officinalis*, *Onobrychis sativa*, *Phacelia*, *Trifolium repens*, *Vicia americana*.

*Osmia nigrifrons* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 103. ♀.

*Osmia casta* Cockerell, 1910. Ent. News 21: 272. ♀.

Biology: Hicks, 1926. Colo. Univ., Studies 15: 246 (nest). —Rust and Thorp, 1973. Kans. Ent. Soc., Jour. 46: 548-562, 26 figs., 2 tables (parasite). —Rust, Thorp and Torchio, 1974. Nat. Hist., Jour. 8: 29-47, 14 figs., 2 tables (nest architecture, life history, parasites).

**nigrobarbata** Cockerell. Wash., Calif., Ariz., Oreg., Idaho?, Utah? and Sask.? Ecology: Nests in burrows in the ground. Parasite: *Dioxya pomonae* Ckll. Pollen: Stores pollen of *Astragalus* including *A. antisellii*, *A. parishii*, *A. pomonensis*, but visits other flowers including *Amsinckia*, *Brodiaea*, *Castilleja*, *Cryptantha*, *Lotus*, *Lupinus*, *Mimulus*, *Penstemon*, *Salvia*, *Vicia*.

*Osmia nigrobarbata* Cockerell, 1916. Pomona Col. Jour. Ent. Zool. 8: 52. ♀.

*Osmia vanduzeei* Sandhouse, 1924. Calif. Acad. Sci., Proc. (4) 13: 343. ♂.

- Biology: Rozen and Favreau, 1967. N. Y. Ent. Soc., Jour. 75: 197-203, 31 figs. (nest architecture, life history, parasite).
- obliqua** White. Calif., Oreg. Pollen: Unknown, but visits flowers of *Astragalus*.  
*Osmia obliqua* White, 1952. Kans. Univ. Sci. Bul. 35: 238, pl. 40, fig. 7; pl. 41, fig. 5; pl. 42, fig. 2; pl. 43, fig. 9; pl. 44, figs. 1, 5. ♂.
- odontogaster** Cockerell. B. C., Wash., Oreg., Calif.  
*Osmia odontogaster* Cockerell, 1897. Acad. Nat. Sci. Phila., Proc. 49: 338. ♂.
- physariae** Cockerell. B. C., Alta. and Sask., south to Calif., Nev., Utah, Colo. and Wyo. Pollen: Unknown, but visits flowers of *Allium*, *Iris missouriensis*, *Lappula*, *Lotus*, *Trifolium hybridum*.  
*Osmia physariae* Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 20: 446. ♂.  
*Osmia pinorum* Cockerell, 1935. Amer. Mus. Novitates 766: 4. ♀.  
*Osmia (Acanthosmioides) erecta* Michener, 1936. Canad. Ent. 68: 40. ♂.  
*Osmia crenulaticornis* Michener, 1936. South. Calif. Acad. Sci., Bul. 35: 84. ♂.
- Taxonomy: Michener, 1949. Kans. Ent. Soc., Jour. 22: 56 (*crenulaticornis*).
- sedula** Sandhouse. B. C., Wash., Wyo., Calif. Pollen: Unknown, but visits flowers of *Layia platyglossa*, *Lotus*, *Phacelia distans*.  
*Osmia sedula* Sandhouse, 1924. Calif. Acad. Sci., Proc. (4) 13: 353. ♀.  
*Osmia lutzi* Michener, 1936. Amer. Mus. Novitates 875: 25. ♀.
- sladeni** Sandhouse. B. C., Alta., Wyo., Utah.  
*Osmia sladeni* Sandhouse, 1925. Canad. Ent. 57: 33. ♂.
- trifoliama** Sandhouse. Oreg. Pollen: Unknown, but visits flowers of *Trifolium hybridum*, *T. pratense*.  
*Osmia (Acanthosmioides) trifoliama* Sandhouse, 1939. Ent. Soc. Wash., Mem. 1: 44. ♀.
- unca** Michener. Oreg., Wash., B. C., Idaho, Mont., Colo., Utah. Ecology: Cells are constructed with a leaf mastic lining surrounded by mud.  
*Osmia (Acanthosmioides) uncinata* Michener, 1936. Canad. Ent. 68: 39. ♂. Preocc.  
*Osmia (Acanthosmioides) unca* Michener, 1937. Ann. and Mag. Nat. Hist. (10) 19: 406. N. name.  
*Osmia (Acanthosmioides) hicksi* Sandhouse, 1939. Ent. Soc. Amer., Mem. 1: 53. ♂.  
*Osmia (Acanthosmioides) depressa* Michener, 1937. Ann. and Mag. Nat. Hist. (10) 19: 406. ♂.
- Biology: Stephen, Bohart and Torchio, 1969. The biology and external morphology of bees, pp. 76, 100, 104 (nest, cell construction).
- watsoni** Cockerell. N. Mex. (Albuquerque).  
*Osmia watsoni* Cockerell, 1911. Amer. Ent. Soc., Trans. 37: 235. ♂.

#### Genus OSMIA Subgenus NOTHOSMIA Ashmead

- Nothosmia* Ashmead, 1899. Amer. Ent. Soc., Trans. 26: 75.  
 Type-species: *Osmia distincta* Cresson. Orig. desig. and monotypic.
- Leucosmia* Robertson, 1903. Amer. Ent. Soc., Trans. 29: 166.  
 Type-species: *Osmia albiventris* Cresson. Orig. desig. and monotypic.
- Xanthosmia* Robertson, 1903. Amer. Ent. Soc., Trans. 29: 166.  
 Type-species: *Osmia cordata* Robertson. Orig. desig. and monotypic.
- albiventris** Cresson. Que. to Ga., west to Ill. and Minn. Pollen: Unknown, but visits flowers of *Brassica*, *Geranium*, *Gillenia*, *Malus*, *Penstemon*, *Rubus*, *Trifolium*, *Vicia*.  
*Osmia albiventris* Cresson, 1864. Ent. Soc. Phila., Proc. 3: 31. ♀, ♂.
- Biology: Medler, 1967. Ent. Soc. Amer., Ann. 60: 341-342, fig. 1, table 1 (nest architecture, supersedure, life history).
- cordata** Robertson. Colo., N. Mex., N. Dak., Ill., Mo., Ohio, Ind. Ecology: Nests in abandoned mud-dauber cells, and in borings in wood. Parasite: *Monodontomerus mandibularis* Gahan, *M. montivagus* Ashm., *M. obscurus* Westw., *Sapyga confluenta* Cress. Pollen: Unknown, but visits flowers of *Aesculus*, *Cardamine*, *Lithospermum*, *Penstemon*, *Phlox*, *Rubus*, *Salvia*, *Trifolium*, *Verbena*.  
*Osmia cordata* Robertson, 1902. Ent. News 13: 79. ♂.

- Osmia hesperella* Cockerell, 1906. Ann. and Mag. Nat. Hist. (7) 17: 227. ♀.  
*Osmia coloradella* Cockerell, 1906. Ann. and Mag. Nat. Hist. (7) 17: 229. ♀.  
*Osmia Ramaleyi* Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 20: 126. ♂, ♀.  
*Osmia figginsi* Cockerell, 1935. Amer. Mus. Novitates 766: 2. ♂.

Taxonomy: Cockerell, 1911. Canad. Ent. 43: 389 (tax. characters, synonymy).

Biology: Turner, 1911. Jour. Anim. Behavior 1: 374 (as "*Stelidae*"). — Rau, 1916. Jour. Anim. Behavior 6: 39. — Rau, 1923. Ent. News 34: 308. — Rau, 1928. Acad. Sci. St. Louis, Trans. 25: 363. — Hicks, 1934. Colo. Univ., Studies 21: 265. — Rau, 1937. Ent. Soc. Amer., Ann. 30: 324 (nest architecture, life history, parasite). — Chandler, 1959 (1958). Indiana Acad. Sci., Proc. 68: 199-204 (life history). — Chandler, 1962. Ent. Soc. Amer., North Central Branch, Proc. 16: 18-19 (interspecific competition). — Chandler, 1963. Ent. Soc. Amer., North Central Branch, Proc. 18: 30 (interspecific competition).

*distincta* Cresson. Ont. and Que., Maine to N. C., west to N. Dak., and Colo. Pollen: Unknown, but visits flowers of *Blephilia*, *Dianthera*, *Gillenia*, *Hypoxis*, *Lithospermum*, *Penstemon*, *Rubus*, *Trifolium*.

*Osmia distincta* Cresson, 1864. Ent. Soc. Phila., Proc. 3: 30. ♀.

*enixa* Sandhouse. Colo., Calif.

*Osmia enixa* Sandhouse, 1924. Calif. Acad. Sci., Proc. (4) 13: 347. ♂.

*grindeliae* Cockerell. Alta., Colo., Wash., Oreg., Calif. Pollen: Unknown, but visits flowers of *Grindelia*.

*Osmia grindeliae* Cockerell, 1910. Psyche 17: 246. ♀.

*inspergens* Lovell and Cockerell. Que. and Maine, south to Ga. Pollen: Unknown, but visits flowers of *Baptisia*, *Polycodium*, *Trifolium*, *Vaccinium*.

*Osmia inspergens* Lovell and Cockerell, 1907. Psyche 14: 17. ♀.

*liogastra* Cockerell. Calif. Pollen: Unknown, but visits flowers of *Lotus*, *Lupinus*, *Phacelia distans*.

*Osmia liogastra* Cockerell, 1933. Pan-Pacific Ent. 9: 26. ♀.

*lupinicola* Cockerell. Calif. Pollen: Unknown, but visits flowers of *Astragalus douglasii*, *Chaetopappa aurea*, *Cryptantha*, *Lotus davidsonii*, *Lupinus*, *Nolina*.

*Osmia lupinicola* Cockerell, 1937. Amer. Mus. Novitates 948: 12. ♀.

*marginata* Michener. South. Calif., desert. Parasite: *Nemognatha macswaini* Enns. Pollen:

Polylectic, visits flowers of *Amsinckia douglasiana*, *Antirrhinum filipes*, *Astragalus coulteri*, *Beleperone californica*, *Chaenactis glabriuscula*, *Dalea mollis*, *D. saundersii*, *Helianthus annuus*, *H. gracilentus*, *Hyptis emoryi*, *Isomeris arborea*, *Larrea tridentata*, *Lotus scoparius*, *Lupinus sparsifolius*, *Mirabilis glutinosa*, *Prosopis*, *Salvia carduacea*.  
*Osmia marginata* Michener, 1936. South. Calif. Acad. Sci., Bul. 35: 86. ♀.

Biology: Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 37 (floral relationships).

*melanopleura* Cockerell. Calif.

*Osmia melanopleura* Cockerell, 1916. Pomona Col. Jour. Ent. Zool. 8: 52. ♀.

*michiganensis* Mitchell. Mich. (Grand Traverse Co.).

*Osmia (Nothosmia) michiganensis* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 92. ♂.

*mixta* Michener. Calif.

*Osmia mixta* Michener, 1936. South. Calif. Acad. Sci., Bul. 35: 88. ♀.

Taxonomy: Michener, 1949. Kans. Ent. Soc., Jour. 22: 56.

*morongana* Cockerell. Calif. Pollen: Unknown, but visits flowers of *Amsinckia*, *Lupinus odoratus*, *Orthocarpus ornatus*, *Hyptis emoryi*.

*Osmia morongana* Cockerell, 1937. Amer. Mus. Novitates 948: 11. ♀.

*nigritula* Friese. No locality known.

*Osmia parva* Provancher, 1883. Nat. Canad. 14: 37. ♂. Preocc.

*Osmia parvula* Dalla Torre, 1896. Cat. Hym., v. 10, p. 405. N. name. Preocc.

*Osmia nigritula* Friese, 1902. Ztschr. System. Hym. Dipt. 2: 109. N. name.

*novaescotiae* Cockerell. N. S. Probably a synonym of *simillima* or *proxima*.

*Osmia novaescotiae* Cockerell, 1912. Canad. Ent. 44: 355. ♀.

**phenax** Cockerell. N. Mex.

*Osmia phenax* Cockerell, 1897. Canad. Ent. 29: 66. ♀.

**prunorum** Cockerell. N. Mex.

*Osmia prunorum* Cockerell, 1897. Canad. Ent. 29: 65. ♀ (♂ misdet.).

**pumila** Cresson. Que. to Ga., west to Ill., Minn., Kans. Ecology: Readily nests in borings.

Parasite: *Chaetodactylus*? sp., *Chrysura pacifica* (Say), *Leucospis affinis* Say, *Melittobia chalybii* Ashm., *Pyemotes ventricosus* (Newport), *Sapyga centrata* Say. Pollen: Apparently polylectic, visits a wide variety of flowers including *Anemonella*, *Antennaria*, *Arabis*, *Astragalus*, *Barbarea*, *Camassia*, *Cardamine*, *Cercis*, *Chaerophyllum*, *Claytonia*, *Collinsia*, *Comandra*, *Cornus*, *Crataegus*, *Dentaria*, *Diospyros*, *Ellisia*, *Erigenia*, *Erythronium*, *Fragaria*, *Geranium*, *Houstonia*, *Isopyrum*, *Krigia*, *Malus*, *Malva*, *Melilotus*, *Mertensia*, *Nepeta*, *Oxalis*, *Pedicularis*, *Penstemon*, *Polemonium*, *Potentilla*, *Ranunculus*, *Ribes*, *Rosa*, *Rubus*, *Salix*, *Sassafras*, *Scutellaria*, *Sisyrinchium*, *Smilax*, *Taraxacum*, *Trifolium*, *Vaccinium*, *Viburnum*, *Vicia*, *Viola*, *Zanthoxylum*, *Zizia*.

*Osmia pumila* Cresson, 1864. Ent. Soc. Phila., Proc. 3: 35. ♀.

*Osmia vicina* Cresson, 1864. Ent. Soc. Phila., Proc. 3: 38. ♂.

*Osmia pumila*(!) Pearson, 1933. Ecol. Monogr. 3: 381.

Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 312-318, tables 32-33 (nest architecture, life history, supersedure, parasites). — Medler, 1967. Ent. Soc. Amer., Ann. 60: 342, table 1 (nest architecture, life history, parasite).

**sandhouseae** Mitchell. New England to Fla., west to Tex. Pollen: Unknown, but visits flowers of *Astragalus*, *Claytonia*, *Crataegus*, *Fragaria*, *Gaylussacia*, *Geranium*, *Ilex*, *Iris*, *Linaria*, *Lupinus*, *Oenothera*, *Pedicularis*, *Penstemon*, *Polycodium*, *Rubus*, *Tephrosia*, *Toxicodendron*, *Trifolium*, *Vaccinium*, *Vicia*.

*Osmia albohirta* Mitchell, 1924. Elisha Mitchell Sci. Soc., Jour. 40: 164. ♀. Preocc.

*Osmia sandhouseae* Mitchell, 1927. Psyche 34: 178. N. name.

**solitaria** Sandhouse. Calif.

*Osmia solitaria* Sandhouse, 1924. Calif. Acad. Sci., Proc. (4) 13: 346. ♂.

Taxonomy: Michener, 1949. Kans. Ent. Soc., Jour. 22: 55.

**titusi** Cockerell. South. Calif., N. Mex.? Pollen: Unknown, but visits flowers of *Astragalus fremontii*, *Lotus*, *Larrea tridentata*, *Lupinus sparsifolius*, *Phacelia fremontii*.

*Osmia titusi* Cockerell, 1905. Canad. Ent. 37: 370. ♀.

### Genus OSMIA Subgenus CHENOSMIA Sinha

*Osmia* Subg. *Chenosmia* Sinha, 1958. Kans. Univ. Sci. Bul. 39: 233.

Type-species: *Osmia pentstemonis* Cockerell. Orig. desig.

**atriventris** Cresson. N. S. to Alta., south to Ia., Ill., Tenn. and Ga. Ecology: Readily nests in artificial nesting devices. Parasite: *Chrysis coerulans* Fabr., *Dibrachys maculipennis* Szelenyi?, *Leucospis affinis* Say, *Sapyga* sp., *Stelis foederalis* Sm. Pollen: Unknown, but visits flowers of *Arabis*, *Astragalus*, *Barbarea*, *Cardamine*, *Cercis canadensis*, *Chrysanthemum leucanthemum*, *Claytonia*, *Collinsia*, *Ellisia*, *Erigenia*, *Fragaria*, *Geranium*, *Gillenia*, *Hydrangea*, *Hypoxis*, *Lithospermum*, *Mertensia*, *Nothoscordum*, *Penstemon*, *Polemonium*, *Psoralea*, *Rubus*, *Trifolium*, *Uvularia*, *Vaccinium*, *Vicia*, *Viola*, *Zizia*.

*Osmia atriventris* Cresson, 1864. Ent. Soc. Phila., Proc. 3: 29. ♀.

Biology: Fye, 1965. Canad. Ent. 97: 872-874, fig. 4, tables 3-4 (nest architecture, life history, parasites).

**bruneri** Cockerell. Mont. to N. Mex., west to B. C. and Calif. Pollen: Unknown, but visits

flowers of *Chamaebatia foliolosa*, *Clarkia rhomboidea*, *Collinsia heterophylla*, *Eriodictyon californicum*, *Erysimum perenne*, *Geranium molle*, *Gilia capitata*, *Hesperochiron*, *Lepechinia calycina*, *Lotus argophyllus*, *L. scoparius*, *Limnanthes douglasii*, *Lupinus lobbi* var. *lyallii*, *Malacothamnus arcuatus*, *Medicago sativa*, *Mimulus guttatus*, *Monardella lanceolata*, *Nemophila spatulata*, *Penstemon heterophyllus*, *P. spectabilis*, *Phacelia distans*, *P. frigida*, *P. heterophylla*, *P. imbricata*,

*Sidalcea malvaeflora*, *Solidago multiradiata*, *Stellaria crispa*, *Streptanthus tortuosus*, *Taraxacum*, *Trifolium microcephalum*, *T. repens*, *Verbena californica*, *V. lasiostachys*, *Vicia americana*, *V. californica*, *V. cracca*.

*Osmia bruneri* Cockerell, 1897. Acad. Nat. Sci. Phila., Proc. 49: 337. ♀.

*Osmia Bennettae* Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 20: 122. ♂.

*Osmia holochlora* Cockerell, 1923. Canad. Ent. 55: 205. ♂.

Biology: Hicks, 1926. Colo. Univ., Studies 15: 242, 243 (nesting habits).

**calla** Cockerell. Idaho to Colo., west to Calif. and B. C. Pollen: Unknown, but visits flowers of *Astragalus*, *Brassica geniculata*, *Brodiaea lutea*, *Cirsium californicum*, *Clarkia rhomboidea*, *Cryptantha intermedia*, *C. lepida*, *Eriodictyon trichocalyx*, *Lepechenia calycina*, *Lotus corniculatus*, *Lotus davidsonii*, *L. scoparius*, *Lupinus albifrons*, *Malacothamnus arcuatus*, *Marrubium vulgare*, *Nema parryi*, *Nemophila integrifolia*, *Penstemon grinnellii*, *P. labrosus*, *Phacelia distans*, *P. heterophylla*, *P. imbricata*, *P. ramosissima*, *Phalacoseris bolanderi*, *Potentilla glandulosa*, *Streptanthus bernardinus*, *Trichostema lanatum*, *Trifolium involueratum*, *T. microcephalum*, *T. repens*, *T. variegatum*, *Verbena lasiostachys*.

*Osmia calla* Cockerell, 1897. Acad. Nat. Sci. Phila., Proc. 49: 337. ♂.

*Osmia Ednae* Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 20: 123. "♀" = ♂.

**caulicola** Cockerell. Wyo., Colo.

*Osmia caulicola* Cockerell, 1934. Brooklyn Ent. Soc., Bul. 29: 17. ♀, ♂.

**cerasi** Cockerell. N. Mex.

*Osmia cerasi* Cockerell, 1897. Canad. Ent. 29: 66. ♀.

**clarescens** Cockerell. South. Calif., N. Mex., Sask.? Ecology: Nest in abandoned cells of *Sceliphron*. Pollen: Polylectic, visits flowers of *Amsinckia douglasii*, *Arctostaphylos patula*, *Astragalus parishii*, *A. pomonensis*, *Beleperone californica*, *Chaenactis glabriuscula*, *Cirsium californicum*, *Cryptantha intermedia*, *Dalea saundersii*, *Eriodictyon crassifolium*, *Helianthus gracilentus*, *Heliotropium curassavicum*, *Hyptis emoryi*, *Isomeris arborea*, *Larrea tridentata*, *Koeberlinia*, *Lotus davidsonii*, *L. glaber*, *L. scoparius*, *Marrubium vulgare*, *Penstemon antirrhinoides*, *P. spectabilis*, *Phacelia davidsonii*, *P. distans*, *P. fremontii*, *Rhus trilobata*, *Ribes indecorum*, *Salvia carnosa*, *S. columbariae*, *S. mellifera*, *Sphaeralcea ambigua*, *Trifolium repens*, *T. variegatum*.

*Osmia clarescens* Cockerell, 1911. Ann. and Mag. Nat. Hist. (8) 8: 764. ♀, ♂.

Biology: Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 36-37 (floral relationships).

**cobaltina** Cresson. Idaho to Colo., west to B. C. and Calif., Ariz.? Pollen: Unknown, but visits a wide variety of flowers including *Ambrosia*, *Arctostaphylos drupacea*, *A. patula*, *Chamaebatia foliolosa*, *Clarkia pulchella*, *C. rhomboidea*, *Eriogonum inflatum*, *Horkelia bolanderi*, *H. tillingi*, *Lotus argophyllus*, *L. davidsonii*, *L. glaber*, *Lupinus austromontanus*, *Minulus primuloides*, *Monardella stricta*, *M. tinoides*, *M. stricta*, *Orthocarpus purpurascens*, *Penstemon bridgesii*, *P. grinnellii*, *P. labrosus*, *P. palmeri*, *Phacelia heterophylla*, *P. imbricata*, *P. ramosissima*, *Phalacoseris bolanderi*, *Potentilla glandulosa*, *Ribes*, *Sambucus nevadensis*, *Senecio lugens*, *Streptanthus bernardinus*, *S. major*, *Vicia americana*.

*Osmia cobaltina* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 104. ♀.

*Osmia bella* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 107. ♂.

*Osmia basilissa* Cockerell, 1911. Ann. and Mag. Nat. Hist. (8) 8: 764. ♀.

*Osmia kermineana* Sandhouse, 1924. Calif. Acad. Sci., Proc. (4) 13: 349. ♀.

**cockerelli** Sandhouse. Colo., N. Mex.

*Osmia (Nothosmia) cockerelli* Sandhouse, 1939. Ent. Soc. Wash., Mem. 1: 104. ♂.

**collinsiae** Robertson. Maine to N. C., west to Minn. and Ill. Pollen: Unknown, but visits flowers of *Astragalus*, *Cardamine*, *Cercis*, *Claytonia*, *Collinsia*, *Dicentra*, *Erythronium*, *Geranium*, *Lupinus*, *Nepeta*, *Pedicularis*, *Penstemon*, *Rubus*, *Trifolium*, *Vicia*, *Viola*.

*Osmia collinsiae* Robertson, 1905. Canad. Ent. 37: 236. ♂.

**cyanopoda** Cockerell. Idaho, Nev., Wash., Oreg., Calif. Pollen: Unknown, but visits flowers of *Amsinckia intermedia*, *Castilleja*, *Cryptantha intermedia*, *Erysimum asperum*, *Lotus scoparius*, *Salvia columbariae*, *S. mellifera*.

*Osmia cyanopoda* Cockerell, 1916. Pomona Col. Jour. Zool. 8: 52. ♀.

*Osmia parallela* Michener, 1936. Amer. Mus. Novitates 875: 19. ♂.

**dolorosa** Sandhouse. B. C., Wash., Oreg., Calif. Pollen: Unknown, but visits flowers of *Clarkia rhomboidea*, *Collinsia tinctoria*, *Horkelia fusca*, *Linnanthes douglasii*, *Lotus argophyllus*, *Rosa*, *Stachys*, *Trifolium microcephalum*, *T. gracilentum*.

*Osmia dolorosa* Sandhouse, 1939. Ent. Soc. Wash., Mem. 1: 123. ♀.

**exigua** Cresson. South. Colo., N. Mex., Calif. Pollen: Unknown, but visits flowers of *Allium parvum*, *Anagallis arvensis*, *Brodiaea elegans*, *B. laxa*, *B. lutea*, *Centaurea melitensis*, *Cirsium vulgare*, *Clarkia unguiculata*, *Diplacus aurantiacus*, *Epilobium minutum*, *Eriodictyon californicum*, *Eriophyllum confertiflorum*, *Geranium molle*, *Helianthella californica*, *Hesperochiron*, *Lepechinia calycina*, *Lotus scoparius*, *L. subpinnatus*, *Lupinus densiflorus*, *Mimulus guttatus*, *Monardella villosa*, *Navarretia heterodoxa*, *Penstemon speciosus*, *Phacelia cicutaria*, *P. distans*, *Plectritis macrocera*, *Satureja douglasii*, *Streptanthus tortuosus*, *Trifolium microcephalum*, *T. variegatum*, *Verbena lasiostachys*, *Viola purpurea*.

*Osmia exigua* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 107. ♂.

*Osmia granulosa* Cockerell, 1911. Ann. and Mag. Nat. Hist. (8) 8: 767. ♀, ♂.

*Osmia exigua*(!) Cresson, 1916. Amer. Ent. Soc., Mem. 1: 118.

*Osmia vana* Sandhouse, 1924. Calif. Acad. Sci., Proc. (4) 13: 349. ♀.

**Taxonomy:** Michener, 1962. Kans. Ent. Soc., Jour. 35: 253-254 (tax. characters, geogr. records).

**gaudiosa** Cockerell. N. Mex., Colo., Ariz., Calif. Pollen: Analyzed pollen masses from two cells revealed 96 per cent Papilionoideae (cf. *Astragalus*, *Vicia*, or *Lathyrus*) and 4 per cent probably Scrophulariaceae (cf. *Stemodia*); visitation records include *Arctostaphylos patula*, *Astragalus*, *Dalea californica*, *Fragaria californica*, *Gilia multicaulis*, *Lathyrus*, *Lotus davidsonii*, *L. scoparius*, *Mirabilis laevis*, *Nemophila integrifolia*, *Phacelia davidsonii*, *P. distans*, *Rhus trilobata*, *Ribes indecorum*, *Salvia columbariae*, *Sambucus caerulea*. Predator: *Metaponium* sp., *Telabis* sp.

*Osmia gaudiosa* Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 19: 538. ♂.

**Taxonomy:** Michener, 1962. Kans. Ent. Soc., Jour. 35: 253-254 (tax. characters, geogr. records).

**Biology:** Krombein, 1967. Trap-nesting wasps and bees, pp. 318-320 (nest architecture, life history, larval food, supersedure, predators).

**hemera** Sandhouse. Calif.

*Osmia (Nothosmia) hemera* Sandhouse, 1939. Ent. Soc. Wash., Mem. 1: 114. ♂.

**illinoensis** Robertson. South. Ill., Tex. Pollen: Unknown, but visits flowers of *Astragalus*, *Fragaria*, *Hypoxis*, *Lithospermum*, *Ranunculus*.

*Osmia illinoensis* Robertson, 1897. Acad. Sci. St. Louis, Trans. 7: 347. ♂.

**indepressa** Sandhouse. Idaho, Nev., Wash., Oreg., Calif. Pollen: Unknown, but visits flowers of *Calyptidium umbellatum*, *Clarkia pulchella*, *Collinsia torreyi*, *Linnanthes douglasii*, *Lotus nevadensis*, *Phacelia hydrophylloides*.

*Osmia (Nothosmia) indepressa* Sandhouse, 1939. Ent. Soc. Wash., Mem. 1: 115. ♀, ♂.

**inermis** (Zetterstedt). Holarctic; Labrador, Que., N. B., Ont., Maine, Mass., Wis., Colo., N. W. T., Alta., Mont., B. C., Wash., Oreg., Calif.; Eurasia. Pollen: Unknown, but visits flowers of *Kalmia polifolia*, *Ledum glandulosum*, *Phyllodoce breweri*, *Rubus*, *Salix*, *Vaccinium*. *Anthophora (Osmia) inermis* Zetterstedt, 1838. Ins. Lapponica, v. 1, p. 466. ♀.

*Osmia parietina* Smith, 1844. Zoologist 2: 743. ♀.

*Osmia globosa* Cresson, 1864. Ent. Soc. Phila., Proc. 3: 36. ♀.

*Osmia vulpecula* Gerstaecker, 1869. Stettin. Ent. Ztg. 30: 335. ♀.

*Osmia globosiformis* Cockerell, 1910. Canad. Ent. 42: 311. ♂.

**inurbana** Cresson. Wyo., Colo., Idaho, Wash., Oreg., Calif., Que.?, Man., Alta.?, B. C.?: Pollen:

Unknown, but visits flowers of *Gilia multicaulis*, *Lotus davidsonii*, *Nemophila integrifolia*, *Potentilla glandulosa*, *Senecio lugens*, *Streptanthus tortuosus*.

*Osmia inurbana* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 107. ♂.

*Osmia eutrichosa* Cockerell, 1910. Canad. Ent. 42: 312. ♂.

- kincaidii** Cockerell. Nebr., N. Mex., Idaho, B. C., Wash., Oreg., Calif. Parasite: *Chrysura sonorensis* (Cam.), *Epistenia* sp., *Leucospis affinis* Say, *Nemognatha scutellaris* LeC. Pollen: Unknown, but visits flowers of *Allium parvum*, *Amsinckia douglasiana*, *Brodiaea*, *Calochortus nudus*, *Chamaebatia foliolosa*, *Clarkia rhomboidea*, *C. unguiculata*, *Fragaria californica*, *Geranium molle*, *Heterogaura heterandra*, *Linanthus montanus*, *Lotus scoparius*, *L. subpinnatus*, *Lupinus micranthus*, *Monardella villosa*, *Nemophila spatulata*, *Phacelia distans*, *Rhamnus californica*, *Sida hederacea*, *Trifolium microcephalum*, *Vicia*.  
*Osmia kincaidii* Cockerell, 1897. Acad. Nat. Sci. Phila., Proc. 49: 334. ♀, ♂.
- lacus** Sandhouse. Oreg., Calif.  
*Osmia* (*Nothosmia*) *lacus* Sandhouse, 1939. Ent. Soc. Wash., Mem. 1: 125. ♂.
- laeta** Sandhouse. Calif., N. Mex.? Parasite: *Nemognatha scutellaris* LeC. Pollen: Unknown, but visits flowers of *Arctostaphylos drupacea*, *A. patula*, *Astragalus*, *Brassica geniculata*, *Cryptantha intermedia*, *Eriodictyon trichocalyx*, *Gilia exilis*, *Lotus argophyllus*, *L. davidsonii*, *L. glaber*, *L. nevadensis*, *L. scoparius*, *L. strigosus*, *Nama parryi*, *Nemophila integrifolia*, *Penstemon centranthifolius*, *P. labrosus*, *P. spectabilis*, *Phacelia imbricata*, *P. heterophylla*, *P. ramosissima*, *Rubus leucodermis*, *Trifolium variegatum*, *Vicia villosa*.  
*Osmia laeta* Sandhouse, 1924. Calif. Acad. Sci., Proc. (4) 13: 350. ♀.  
*Osmia aglaia* Sandhouse, 1939. Ent. Soc. Wash., Mem. 1: 112. ♀.
- malina** Cockerell. Wash., Calif., Colo. Pollen: Unknown, but visits flowers of *Arctostaphylos drupacea*, *Ceanothus cordulatus*, *C. leucodermis*, *C. integerrimus*, *Chamaebatia foliolosa*, *Comandra umbellata*, *Lotus argophyllus*, *L. crassifolius*, *L. davidsonii*, *L. nevadensis*, *Lupinus austromontanus*, *Mimulus guttatus*, *Phacelia ramosissima*, *Streptanthus tortuosus*, *Trifolium gracilentum*.  
*Osmia malina* Cockerell, 1909. Entomologist 42: 94. ♀.
- mertensiae** Cockerell. Colo., Calif.?, B. C.? Pollen: Unknown, but visits flowers of *Lappula floribunda*, *Mertensia*.  
*Osmia mertensiae* Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 20: 488. ♂.
- Taxonomy: Cockerell, 1934. Amer. Mus. Novitates 732: 5. ♀.
- nanula** Cockerell. Idaho, Utah, Colo., B. C., Wash., Oreg. Pollen: Unknown, but visits flowers of *Phacelia*.  
*Osmia nanula* Cockerell, 1897. Acad. Nat. Sci. Phila., Proc. 49: 339. ♀.  
*Osmia phaceliae* Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 19: 364. ♀.
- pagosa** Sandhouse. Oreg., Colo., Calif. Pollen: Unknown, but visits flowers of *Vicia californica*.  
*Osmia* (*Nothosmia*) *pagosa* Sandhouse, 1939. Ent. Soc. Wash., Mem. 1: 89. ♀.
- pentstemonis** Cockerell. Alta., Idaho, Utah, Colo., B. C., Wash., Oreg., Calif. Pollen: Unknown, but visits flowers of *Fragaria californica*, *Gormanina obtusata*, *Penstemon heterodoxus*, *P. newberryi*. Predator: *Philanthus pulcher* Dalla Torre.  
*Osmia pentstemonis* Cockerell, 1906. Amer. Mus. Nat. Hist., Bul. 22: 451. ♀.
- pingreeana** Michener. Colo.  
*Osmia pingreeana* Michener, 1937. Ann. and Mag. Nat. Hist. (10) 19: 408. ♀.
- potentillae** Michener. Calif. Pollen: Unknown, but visits flowers of *Calyptidium umbellatum*, *Fragaria californica*, *Lotus nevadensis*, *L. scoparius*, *Navaretia divaricata*, *Nemophila integrifolia*, *Phacelia ramosissima*, *Potentilla glandulosa*.  
*Osmia potentillae* Michener, 1936. South. Calif. Acad. Sci., Bul. 35: 89. ♀.
- Taxonomy: Michener, 1949. Kans. Ent. Soc., Jour. 22: 56.
- proxima** Cresson. Alaska to N. S., south to Oreg., Idaho, Wyo., N. Dak., Ill. and Ga. Parasite: *Stelis submarginata* (Cress.). Pollen: Unknown, but visits flowers of *Houstonia*, *Penstemon*, *Rubus*, *Trifolium*.  
*Osmia proxima* Cresson, 1864. Ent. Soc. Phila., Proc. 3: 32. ♂.  
*Osmia sericea* Cresson, 1864. Ent. Soc. Phila., Proc. 3: 27. ♂.  
*Osmia melanotricha* Lovell and Cockerell, 1907. Psyche 14: 16. ♀.



- Biology: Fye, 1965. *Canad. Ent.* 97: 874, tables 2-4 (nest, parasite). — Medler, 1967. *Ent. Soc. Amer.*, Ann. 60: 342 (nest, parasite).
- pulsatillae** Cockerell. Idaho, Wyo., Colo., Wash., Oreg., Calif. Pollen: Unknown, but visits flowers of *Epilobium glaberrimum*.  
*Osmia pulsatillae* Cockerell, 1907. *Ann. and Mag. Nat. Hist.* (7) 19: 363. ♂.
- pusilla** Cresson. Wash., Oreg., Calif., Colo., N. Mex.? Pollen: Unknown, but visits flowers of *Gayophytum diffusum*, *Nemophila integrifolia*, *Phacelia davidsonii*, *Phalacoseris bolanderi*, *Potentilla glandulosa*, *Sanicula nevadensis*.  
*Osmia pusilla* Cresson, 1864. *Ent. Soc. Phila.*, Proc. 3: 35. ♂.
- regulina** Cockerell. Oreg., Calif. Pollen: Unknown, but visits flowers of *Astragalus*, *Calandrinia caulescens* var. *menziesii*, *Chaenactis glabriuscula*, *Cryptantha intermedia*, *Gilia multicaulis*, *Lotus argophyllus*, *L. scoparius*, *Salvia mellifera*, *Trifolium involucreatum*, *T. repens*, *T. variegatum*.  
*Osmia regulina* Cockerell, 1911. *Ann. and Mag. Nat. Hist.* (8) 8: 766. ♀ (♂ misdet.).
- sanctaerosae** Cockerell. Calif. Pollen: Unknown, but visits flowers of *Eriodictyon californicum*, *Lotus argophyllus*, *L. davidsonii*, *Lupinus confertus*.  
*Osmia sanctae-rosae* Cockerell, 1910. *Ent. News* 21: 121. ♀.
- sequoiae** Michener. Calif.  
*Osmia sequoiae* Michener, 1936. *South. Calif. Acad. Sci.*, Bul. 35: 89. ♀.
- Taxonomy: Michener, 1949. *Kans. Ent. Soc.*, Jour. 22: 57.
- tersula** Cockerell. Alaska to Hudson Bay and N. B., south to Oreg., Colo., Wis. and Mich.  
 Parasite: *Sapyga martinii* Sm.? Pollen: Unknown, but visits flowers of *Rubus*.  
*Osmia tersula* Cockerell, 1912. *Canad. Ent.* 44: 358. ♂.  
*Osmia subarctica* Cockerell, 1912. *Canad. Ent.* 44: 357. ♀.
- Biology: Medler, 1967. *Ent. Soc. Amer.*, Ann. 60: 342-343, figs. 1-2, tables 1-2 (nest architecture, life history, parasite).
- tokopahensis** Michener. Calif.  
*Osmia tokopahensis* Michener, 1936. *South. Calif. Acad. Sci.*, Bul. 35: 87. ♀.
- Taxonomy: Michener, 1949. *Kans. Ent. Soc.*, Jour. 22: 58.
- trevoris** Cockerell. B. C. and Alta., south to Calif., Nev., Colo., and Wyo.  
*Osmia trevoris* Cockerell, 1897. *Acad. Nat. Sci. Phila.*, Proc. 49: 341. ♀.  
*Osmia subtrevoris* Cockerell, 1906. *Amer. Mus. Nat. Hist.*, Bul. 22: 451. ♀.  
*Osmia corksini* Sandhouse, 1924. *Ent. News* 35: 351. ♀.
- tristella cyanosoma** Cockerell. Calif. Pollen: Unknown, but visits flowers of *Ceanothus*, *Dalea saundersii*, *Diplacus aurantiacus*, *Lotus davidsonii*, *Lupinus longipes*, *Monardella*, *Nemophila integrifolia*, *Penstemon grinnellii*, *Phacelia hydrophyloides*, *Prunus emarginata*, *Rubus vitifolius*, *Senecio lugens*.  
*Osmia cyanosoma* Cockerell, 1916. *Pomona Col. Jour. Ent. Zool.* 8: 52. ♀.
- tristella tristella** Cockerell. B. C., Wash., Oreg., Calif., Idaho, Colo., Que.? Pollen: Unknown, but visits flowers of *Diplacus aurantiacus*, *Lepechinia calycina*, *Lotus scoparius*.  
*Osmia tristella* Cockerell, 1897. *Acad. Nat. Sci. Phila.*, Proc. 49: 340. ♀.  
*Osmia hypoleuca* Cockerell, 1907. *Ann. and Mag. Nat. Hist.* (7) 19: 366. ♀.
- virga** Sandhouse. Mass. to Wis., south to Va. Pollen: Unknown, but visits flowers of *Salix*.  
*Osmia virga* Sandhouse, 1939. *Ent. Soc. Wash.*, Mem. 1: 130. ♂.
- zephyros** Sandhouse. Calif. Ecology: Nests in oak gall. Pollen: Unknown, but visits flowers of *Collinsia parviflora*.  
*Osmia zephyros* Sandhouse, 1939. *Ent. Soc. Wash.*, Mem. 1: 132. ♂, ♀.

#### Genus OSMIA Subgenus EUTHOSMIA Sinha

*Osmia* subg. *Euthosmia* Sinha, 1958. *Kans. Univ. Sci. Bul.* 39: 235.

Type-species: *Heriades glaucum* Fowler. Orig. desig.

**glaucia** (Fowler). Calif. Ecology: Nests in abandoned burrows and also trap-nests; uses mud for cell construction. Parasite: *Stelis sexmaculata* Ashm. Pollen: Oligolege of *Collinsia*

including *C. bicolor*, *C. heterophylla*, *C. sparsifolia*, but visits other flowers presumably for nectar including *Alyssum maritimum*, *Convolvulus*, *Cryptantha*, *Geranium dissectum*, *G. molle*, *Gilia tricolor*, *Lasthenia chrysostoma*, *Lupinus bicolor*, *L. micranthus*, *Melilotus indica*, *Mimulus*, *Nemophila integrifolia*, *N. pulchella*, *Phacelia distans*, *P. douglasii*, *P. rattani*, *Platystemon californicus*, *Plectritis macrocera*, *Rhus trilobata*, *Trifolium microcephalum*.

*Heriades glaucum* Fowler, 1899. *Psyche* 8: 405. ♂.

*Osmia exilis* Sandhouse, 1924. *Calif. Acad. Sci., Proc.* (4) 13: 351. ♀.

Taxonomy: Snelling, 1967. *South. Calif. Acad. Sci., Bul.* 66: 103 (tax. status).

Biology: Linsley and MacSwain, 1941. *South. Calif. Acad. Sci., Bul.* 40: 129 (nest). — Rust and Clement, 1972. *Kans. Ent. Soc., Jour.* 45: 523-528, 1 fig., 1 table (nest architecture, life history, floral relationships, parasite, biological characteristics).

### Genus OSMIA Subgenus MYSTACOSMIA Snelling

*Osmia* subg. *Mystacosmia* Snelling, 1967. *South. Calif. Acad. Sci., Bul.* 66: 104.

Type-species: *Osmia nemoris* Sandhouse. Orig. design.

**nemoris** Sandhouse, B. C., Idaho and Mont., south to Calif. and Utah. Ecology: Nests in abandoned burrows of *Diadasia diminuta* Cress. as well as trap-nests; uses masticated leaf material from *Malva rotundifolia* and *Sphaeralcea coccinea* cemented with resin for cell construction. Pollen: Collects pollen primarily from flowers of *Penstemon* and various legumes; visitation records include *Astragalus*, *Brassica*, *Brodiaea congesta*, *B. elegans*, *B. laxa*, *B. lutea*, *B. pulchella*, *Calochortus luteus*, *C. venustus*, *Chamaebatia foliolosa*, *Chaenactis glabriuscula*, *Cirsium*, *Clarkia biloba*, *C. cylindrica*, *C. dudleyana*, *C. gracilis*, *C. pulchella*, *C. purpurea viminea*, *C. speciosa*, *C. unguiculata*, *Collinsia callosa*, *Convolvulus malacophyllus*, *C. subacaulis*, *Cryptantha*, *Dodecatheon hendersoni*, *Eriogonum fasciculatum*, *Geranium molle*, *Grindelia*, *Lasthenia chrysostoma*, *Layia platyglossa*, *Linanthus parviflorus*, *Lotus scoparius*, *L. subpinnatus*, *Lupinus*, *Medicago sativa*, *Mimulus*, *Monardella villosa*, *Orthocarpus purpurascens*, *Penstemon*, *Phacelia ciliata*, *P. distans*, *Plectritis macrocera*, *Prunus ilicifolia*, *Raphanus sativus*, *Rhus ovata*, *Rosa californica*, *Rubus*, *Salvia*, *Satureja*, *Sisymbrium*, *Trifolium involucreatum*, *T. microcephalum*, *T. repens*, *T. tridentatum*, *Vicia americana*, *Wyethia*.

*Osmia nemoris* Sandhouse, 1924. *Calif. Acad. Sci., Proc.* (4) 13: 345. ♂.

*Osmia seclusa* Sandhouse, 1924. *Calif. Acad. Sci., Proc.* (4) 13: 352. ♀.

*Osmia abdominalis* Michener, 1935. *Pan-Pacific Ent.* 11: 184. ♂.

Taxonomy: Snelling, 1967. *South. Calif. Acad. Sci., Bul.* 66: 103 (synonymy).

Biology: Bohart, 1955. *Ent. Soc. Wash., Proc.* 57: 235-236 (nest architecture, life history).

— Rust and Clement, 1972. *Kans. Ent. Soc., Jour.* 45: 523-528, table 1 (nest architecture, life history, biological characteristics). — MacSwain, Raven and Thorp, 1973. *Calif. Univ. Pubs. Ent.* 70: 52 (floral relationships, as *seclusa*).

### Genus OSMIA Subgenus MONILOSMIA Robertson

*Monilosmia* Robertson, 1903. *Amer. Ent. Soc., Trans.* 29: 166.

Type-species: *Osmia simillima* Smith. Orig. design. and monotypic. (= *Osmia canadensis* Cresson).

**albolateralis albolateralis** Cockerell. Alta. to N. Mex., west to B. C. and Wash.

*Osmia dubia* Cresson, 1864. *Ent. Soc. Phila., Proc.* 3: 29. ♀. Preoc.

*Osmia albolateralis* Cockerell, 1906. *Amer. Mus. Nat. Hist., Bul.* 22: 450. ♀.

?*Osmia enena* Cockerell, 1907. *Ann. and Mag. Nat. Hist.* (7) 20: 448. ♂.

**albolateralis visenda** Sandhouse. Oreg., Calif. Pollen: Unknown, but visits flowers of *Astragalus antisellii*, *A. douglasii*, *Clarkia cylindrica*, *C. rhomboidea*, *Collinsia tinctoria*, *Erysimum asperum*, *Horkelia tillingii*, *Iris hartwegii*, *Lathyrus alfeldii*, *Lotus argophyllus*, *L. davidsonii*, *Montia perfoliata*, *Nemophila integrifolia*, *Penstemon*

*spectabilis*, *Phacelia*, *Senecio lugens*, *Sidalcea malvaeflora*, *Vicia californica*, *V. truncata*, *Viola purpurea*.

*Osmia visenda* Sandhouse, 1924. Calif. Acad. Sci., Proc. (4) 13: 355. ♀.

**atrocyanea atrocyanea** Cockerell. Wash., Oreg., Calif., Colo., Utah, Nev. Parasite: *Sapyga angustata* Cress. Pollen: Unknown, but visits flowers of *Clarkia rhomboidea*, *Cryptantha intermedia*, *Cirsium*, *Eriodictyon californicum*, *Lotus glaber*, *L. scoparius*, *Lupinus*, *Penstemon laetus*, *Phacelia*, *Ribes*, *Rubus ursinus*, *Sidalcea malvaeflora*, *Trifolium involucratum*, *T. variegatum*, *Verbena lasiostachys*, *Vicia californica*, *V. villosa*.

*Osmia atrocyanea* Cockerell, 1897. Acad. Nat. Sci. Phila., Proc. 49: 344. ♀.

*Osmia senior* Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 19: 368. ♀.

*Osmia pseudamala* Cockerell, 1910. Canad. Ent. 42: 312. ♂.

Taxonomy: Cockerell, 1930. Ann. and Mag. Nat. Hist. (10) 5: 163. ♂, ♀.

**atrocyanea putata** Cockerell. South. Calif. Pollen: Unknown, but visits flowers of *Arctostaphylos drupacea*, *A. patula*, *Cryptantha intermedia*, *Iris hartwegii*, *Lathyrus californicus*, *Lupinus confertus*, *L. latifolius*, *Nemophila integrifolia*, *Penstemon spectabilis*, *Ribes roezlii*, *Vicia californica*.

*Osmia putata* Cockerell, 1910. Ent. News 21: 272. ♀.

**brevis brevis** Cresson. Wyo., Colo., Utah, Ariz., B. C., Oreg., north. and cent. Calif.

*Osmia brevis* Cresson, 1864. Ent. Soc. Phila., Proc. 3: 36. ♀.

*Osmia wilmattae* Cockerell, 1906. Ann. and Mag. Nat. Hist. (7) 17: 228. ♀.

?*Osmia wheeleri* Cockerell, 1906. Amer. Mus. Nat. Hist., Bul. 22: 449. ♂.

**brevis peridonea** Sandhouse. South. Calif. Pollen: Unknown, but visits flowers of *Astragalus antisellii*, *Arctostaphylos drupacea*, *Castilleja*, *Clarkia*, *Collinsia heterophylla*, *C. tinctoria*, *Cryptantha intermedia*, *C. lepida*, *Eriodictyon californicum*, *E. crassifolium*, *Fragaria californica*, *Gilia exilis*, *Horkelia tillingii*, *Lotus davidsonii*, *L. scoparius*, *Lupinus bicolor*, *Nama parryi*, *Penstemon antirrhinoides*, *P. grinnellii*, *P. heterophyllus*, *P. spectabilis*, *Phacelia andersonii*, *P. davidsonii*, *Phalacoseris bolanderi*, *Psoralea californica*, *Rhus trilobata*, *Salvia carnosa*, *Streptanthus bernardinus*, *S. tortuosus*, *Taraxacum*.

*Osmia peridonea* Sandhouse, 1924. Calif. Acad. Sci., Proc. (4) 13: 348. ♂.

**bridwelli** Sandhouse. Nev., Calif. Pollen: Unknown, but visits flowers of *Agastache urticifolia*, *Brodiaea coronaria*, *B. lutea*, *Chamaebatia foliolosa*, *Glycyrrhiza lepidota*, *Iris hartwegii*, *Lathyrus sulphureus*, *Lotus nevadensis*, *Lupinus albifrons*, *L. densiflorus*, *L. succulentus*, *Mimulus guttatus*, *Penstemon spectabilis*, *Psoralea physodes*, *Sedum*, *Streptanthus tortuosus*, *Vicia californica*, *Wyethia helenioides*.

*Osmia (Nothosmia) bridwelli* Sandhouse, 1939. Ent. Soc. Wash., Mem. 1: 100. ♂, ♀.

**cara** Cockerell. South. Calif., Nev. Pollen: Unknown, but visits flowers of *Cirsium californicum*, *Clarkia*, *Dicentra chrysantha*, *Eriodictyon californicum*, *E. trichocalyx*, *Lotus crassifolius*, *L. davidsonii*, *L. glaber*, *L. scoparius*, *Lupinus densiflorus*, *L. nanus*, *Mimulus*, *Nama parryi*, *Penstemon heterophyllus*, *P. laetus*, *P. spectabilis*, *Trichostema parishii*.

*Osmia cara* Cockerell, 1910. Ent. News 21: 271. ♀.

**cyanella** Cockerell. Wash., Oreg., Calif., Colo., Utah, Nev. Pollen: Unknown, but visits flowers of *Chamaebatia foliolosa*, *Cirsium californicum*, *Collinsia heterophylla*, *C. tinctoria*, *Cryptantha intermedia*, *Eriodictyon californicum*, *Eriophyllum confertiflorum*, *Fragaria californica*, *Heterogaura californica*, *Iris hartwegii*, *Lepechinia calycina*, *Linanthus parviflorus*, *Lotus davidsonii*, *L. nevadensis*, *L. scoparius*, *Lupinus*, *Mimulus guttatus*, *Penstemon grinnellii*, *P. heterodoxus*, *P. speciosus*, *Phacelia californica*, *P. heterophylla*, *P. imbricata*, *P. ramosissima*, *Potentilla glandulosa*, *Ranunculus californicus*, *Streptanthus tortuosus*.

*Osmia cyanella* Cockerell, 1897. Acad. Nat. Sci. Phila., Proc. 49: 340. ♀.

*Osmia aprilina* Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 19: 364. ♂.

*Osmia aprilina atrovirens* Sandhouse, 1924. Calif. Acad. Sci., Proc. (4) 13: 347. ♂.

*Osmia brevior* Michener, 1936. Amer. Mus. Novitates 875: 20. ♀.

**cyaneonitens** Cockerell. S. Dak., Colo.

*Osmia cyaneonitens* Cockerell, 1906. Amer. Mus. Nat. Hist., Bul. 22: 448. ♂.

- Osmia brevihirta* Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 19: 365. ♀.
- densa densa** Cresson. Mont. to N. Mex., west to B. C., cent. Calif., and Ariz. Pollen: Polylectic, visits a wide variety of flowers including *Arctostaphylos crustacea*, *A. mariposa*, *Brodiaea lutea*, *B. pulchella*, *Calochortus nudus*, *Ceanothus integerrimus*, *Chamaebatia foliolosa*, *Cirsium californicum*, *Clarkia breweri*, *C. dudleyana*, *C. rhomboidea*, *C. unguiculata*, *Convolvulus malacophyllus*, *Eriodictyon californicum*, *Eriogonum inflatum*, *Gilia capitata*, *Hackelia jessicae*, *Horkelia fusca*, *Iris hartwegii*, *Lathyrus graminifolius*, *L. sulphureus*, *Linnanthes douglasii*, *Lotus argophyllus*, *Lupinus albifrons*, *L. bicolor*, *L. latifolius*, *L. micranthus*, *L. stiversi*, *Mimulus guttatus*, *M. primuloides*, *M. suksdorfii*, *Monardella lanceolata*, *Penstemon spectabilis*, *Phacelia heterophylla*, *Ranunculus californicus*, *Ribes nevadensis*, *Spraguea umbellata*, *Streptanthus tortuosus*, *Thermopsis malacophyllus*, *Verbena lasiostachys*, *Vicia californica*.
- Osmia densa* Cresson, 1864. Ent. Soc. Phila., Proc. 3: 25. ♀.
- Osmia olivacea* Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 19: 362. ♂.
- Osmia proposita* Sandhouse, 1924. Calif. Acad. Sci., Proc. (4) 13: 354. ♀.
- densa pogonigera** Cockerell. Calif. Parasite: *Tricrania stansburyi* Hald. Pollen: Polylectic, visits a wide variety of flowers including *Arctostaphylos drupacea*, *A. patula*, *Astragalus antisellii*, *A. parishii*, *Barbarea orthoceras*, *Ceanothus cordulatus*, *Clarkia breweri*, *C. unguiculata*, *Convolvulus*, *Cryptantha intermedia*, *Dicentra chrysantha*, *Epilobium angustifolium*, *Horkelia bernardina*, *Lathyrus*, *Lotus crassifolius*, *L. davidsonii*, *L. scoparius*, *Lupinus austromontanus*, *L. confertus*, *L. formosus*, *L. grayi*, *Malus*, *Marrubium vulgare*, *Nemophila integrifolia*, *Penstemon grinnellii*, *P. spectabilis*, *Phacelia davidsonii*, *P. distans*, *P. heterophylla*, *Rhamnus californica*, *Rhododendron occidentale*, *Ribes cereum*, *R. roezlii*, *Vicia arvensis*, *V. californica*.
- Osmia pogonigera* Cockerell, 1910. Ent. News 21: 121. ♀.
- Osmia celsa* Sandhouse, 1924. Calif. Acad. Sci., Proc. (4) 13: 354. ♀.
- felti** Cockerell. New England to Minn., south to West Va.
- Osmia felti* Cockerell, 1911. Ent. News 22: 18. ♀.
- gabrielis** Cockerell. Oreg., Calif. Pollen: Unknown, but visits flowers of *Brodiaea lutea*, *Castilleja*, *Clarkia cylindrica*, *Diplacus aurantiacus*, *Glycyrrhiza lepidota*, *Iris hartwegii*, *Lathyrus sulphureus*, *Lotus glaber*, *L. scoparius*, *Lupinus albifrons*, *L. formosus*, *L. subspicata*, *Marrubium vulgare*, *Orthocarpus lithospermoides*, *Penstemon speciosus*, *Psoralea physodes*, *P. rigida*, *Salvia mellifera*, *Streptanthus bernardinus*, *Trifolium variegatum*, *Vicia californica*.
- Osmia gabrielis* Cockerell, 1910. Ent. News 21: 120. ♀.
- hendersoni** Cockerell. Mont., Wyo., Colo., Utah, Oreg. Calif. (Sierra Nevada Mts.).
- Osmia hendersoni* Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 19: 365. ♀.
- hesperos** Sandhouse. Calif., Oreg.
- Osmia hesperos* Sandhouse, 1939. Ent. Soc. Wash., Mem. 1: 131. ♂.
- iridis** Cockerell and Titus. Colo., N. Mex., Calif. Pollen: Unknown, but visits flowers *Collinsia callosa*, *Malus*.
- Osmia iridis* Cockerell and Titus, 1902. Amer. Nat. 36: 816. ♂.
- juxta juxta** Cresson. Alta. to N. Mex., west to Idaho and Ariz.
- Osmia juxta* Cresson, 1864. Ent. Soc. Phila., Proc. 3: 19. ♀.
- Osmia theta* Sandhouse, 1925. Canad. Ent. 57: 34. ♂.
- Osmia subpurpurea jamesi* Michener, 1937. Ann. and Mag. Nat. Hist. (10) 19: 409. ♀.
- juxta subpurpurea** Cockerell. B. C. to Calif. Pollen: Unknown, but visits flowers of *Brodiaea congesta*, *Geranium*, *Lotus scoparius*, *Lupinus lobbii* var. *lyallii*, *L. longipes*, *Mertensia*, *Penstemon speciosus*, *Phalacoseris bolanderi*, *Plectritis macrocera*, *Salvia columbariae*, *Trifolium microcephalum*, *Wyethia angustifolia*.
- Osmia subpurpurea* Cockerell, 1897. Acad. Nat. Sci. Phila., Proc. 49: 344. ♀.
- paradisica** Sandhouse. Wash., Oreg., Calif. (Sierra Nevada Mts.). Pollen: Unknown, but visits flowers of *Eriogonum*.
- Osmia paradisica* Sandhouse, 1924. Calif. Acad. Sci., Proc. (4) 13: 343. ♂.
- rawlini** Sandhouse. Wyo., Calif.
- Osmia (Nothosmia) rawlini* Sandhouse, 1939. Ent. Soc. Wash., Mem. 1: 115. ♀.

- rostrata** Sandhouse. Calif. Pollen: Unknown, but visits flowers of *Amsinckia douglasiana*, *Grossularia*, *Phacelia tanacetifolia*.  
*Osmia rostrata* Sandhouse, 1924. Calif. Acad. Sci., Proc. (4) 13: 351. ♀.
- sculleni** Sandhouse. Oreg., Calif., Utah, Colo. Pollen: Unknown, but visits flowers of *Hackelia jessicae*.  
*Osmia* (*Nothosmia*) *sculleni* Sandhouse, 1939. Ent. Soc. Wash., Mem. 1: 82. ♀.
- simillima** Smith. N. S., west to N. W. T. and B. C., south to Oreg., Ariz., and N. C. Parasite:  
*Leucospis affinis* Say, *Stelis submarginata* (Cress.). Pollen: Unknown, but visits flowers of *Althaea*, *Barbarea*, *Oxalis*, *Penstemon*, *Ranunculus*, *Rubus*, *Vicia*, *Viola*.  
*Osmia simillima* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 142. ♀, ♂.  
*Osmia canadensis* Cresson, 1864. Ent. Soc. Phila., Proc. 3: 33. ♂.  
*Osmia cognata* Cresson, 1864. Ent. Soc. Phila., Proc. 3: 33. ♂.  
*Osmia major* Robertson, 1902. Ent. News 13: 79. ♀ (♂ misdet.).  
*Osmia chlorops* Cockerell and Titus, 1902. Amer. Nat. 36: 816. ♂.  
*Osmia stasima* Lovell, 1909. Ent. News 20: 125. ♀.
- Taxonomy:** Cockerell, 1905. Amer. Ent. Soc., Trans. 31: 332. —Cockerell, 1906. Amer. Mus. Nat. Hist., Bul. 22: 448. ♂. —Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 80-81, figs. 28, 32, 35 (redescription, synonymy).
- Biology:** Packard, 1867. Amer. Nat. 1: 377 (nest). —Saunders, 1872. Canad. Ent. 4: 237 (nest, as *canadensis*). —Graenicher, 1935. Ent. Soc. Amer., Ann. 28: 285 (nest, parasite).

#### Genus OSMIA Subgenus TRICHINOSMIA Sinha

- Osmia* subg. *Trichinosmia* Sinha, 1958. Kans. Univ. Sci. Bul. 39: 244.  
 Type-species: *Osmia latisulcata* Michener. Monotypic and orig. desig.
- latisulcata** Michener. Ariz., Nev., Calif. Pollen: Unknown, but visits flowers of *Amsinckia*, *Arctostaphylos glandulosa*, *Astragalus douglasii*, *Chaetopappa aurea*, *Dalea*, *Cryptantha intermedia*, *Eriodictyon californicum*, *Lotus scoparius*, *L. strigosus*, *Lupinus*, *Salix*, *Salvia carnosae*, *S. columbariae*.  
*Osmia latisulcata* Michener, 1936. South. Calif. Acad. Sci., Bul. 35: 86. ♀.

#### Genus OSMIA Subgenus DICERATOSMIA Robertson

- Diceratosmia* Robertson, 1904. Amer. Ent. Soc., Trans. 29: 166.  
 Type-species: *Osmia conjuncta* Cresson. Monotypic and orig. desig. (= *Osmia quadridentata* Cresson).
- Revision:** Michener, 1949. Ent. Soc. Amer., Ann. 42: 258-264 (Nearctic spp.).
- Taxonomy:** Hurd and Michener, 1955. Calif. Ins. Surv., Bul. 3: 215-217, fig. 4, pl. 11, map 112 (Calif. spp.). —Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 81-85, figs. 29, 31-32, table 4 (eastern U. S. spp.).
- botitena** (Cockerell). Tex.  
*Osmia botitena* Cockerell, 1909. Ann. and Mag. Nat. Hist. (8) 4: 30. ♀.  
*Osmia conjuncta marilaunidii* Cockerell, 1914. Ann. and Mag. Nat. Hist. (8) 14: 363. ♂.
- conjuncta** (Cresson). Ont. to Minn., south to N. C. and Tex. Ecology: Nests in snail shells. Pollen: Polylectic, visits flowers of many families, especially Leguminosae and Scrophulariaceae, including *Anemonella*, *Blephilia*, *Cardamine*, *Cercis*, *Collinsia*, *Dentaria*, *Fragaria*, *Geranium*, *Hydrophyllum*, *Lupinus*, *Osmorrhiza*, *Polemonium*, *Psoralea*, *Ranunculus*, *Rubus*, *Scutellaria*, *Stellaria*, *Trifolium*, *Viola*.  
*Osmia conjuncta* Cresson, 1864. Ent. Soc. Phila., Proc. 3: 31. ♀.  
*Osmia 4-dentata* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 107. ♂. Preocc.  
*Osmia cressoni* Dalla Torre, 1896. Cat. Hym., v. 10, p. 392. N. name.  
*Osmia quadridentata* Dalla Torre, 1896. Cat. Hym., v. 10, p. 392. Emend.
- Biology:** Rau, 1937. Ent. Soc. Amer., Ann. 30: 330 (nest).

*subfasciata miamiensis* Mitchell. Southern Fla. Pollen: Unknown, but visits flowers of *Crotalaria*.

*Osmia (Diceratomia) subfasciata miamiensis* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 84. ♀, ♂.

*subfasciata subfasciata* Cresson. N. J. to Fla., west to south. Calif.; northern Mexico. Ecology:

Nests in abandoned beetle burrows, also accepts artificial nesting devices. Parasite:

*Melittobia chalybii* Ashm. Pollen: Polylectic, visits a wide variety of flowers including *Achillea*, *Acacia greggii*, *Amorpha fruticosa*, *Astragalus*, *Cercis canadensis*, *Coreopsis*, *Gaillardia pulchella*, *Helenium tenuifolium*, *Helianthus*, *Heliotropium curassavicum* var. *oculatum*, *Larrea tridentata*, *Lesquerella*, *Lotus scoparius*, *Machaeranthera tenacetifolium*, *Marilaunidium organifolium*, *Marrubium vulgare*, *Medicago sativa*, *Melilotus officinalis*, *Monarda citriodora*, *Oxalis*, *Palafoxia linearis*, *Parkinsonia aculeata*, *Phacelia*, *Pluchea sericea*, *Prosopis juliflora*, *Prunus*, *Rhus*, *Rubus*, *Salix*, *Sphaeralcea*, *Vicia*.

*Osmia subfasciata* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 261. ♀, ♂.

*Osmia conjunctoides* Robertson, 1893. Amer. Ent. Soc., Trans. 20: 276. ♂.

*Osmia punctata* Michener, 1936. South. Calif. Acad. Sci., Bul. 35: 85. ♀.

Biology: Linsley, 1946. Econ. Ent., Jour. 39: 24 (nest sites, pollination of alfalfa). — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 84 (nest). — Krombein, 1967. Trap-nesting wasps and bees, pp. 311-312 (nest architecture, life history, parasite).

### Genus OSMIA Subgenus Unassigned

*angustipes* Cockerell. Colo.

*Osmia angustipes* Cockerell, 1933. Pan-Pacific Ent. 9: 158. ♂.

*claremontensis* Michener. Mont., Wash., Oreg., Calif. Pollen: Unknown, but visits flowers of *Arctostaphylos patula*, *Collinsia heterophylla*, *Cryptantha intermedia*, *Phacelia distans*, *Trifolium repens*.

*Osmia claremontensis* Michener, 1936. South. Calif. Acad. Sci., Bul. 35: 84. ♂.

Taxonomy: Snelling, 1967. South. Calif. Acad. Sci., Bul. 66: 106-107 (tax. status).

*foxi* Cameron. N. Mex.

*Osmia Foxi* Cameron, 1901. Amer. Ent. Soc., Trans. 27: 316. ♂.

### NOMEN NUDUM IN OSMIA

*Osmia pacifica* Packard, 1892. Psyche 6: 340.

### Genus MEGACHILE Latreille

This genus, which is nearly cosmopolitan in distribution, has until recently included all of the so-called leaf-cutter bees regardless of whether the various species cut leaves with which to make their nests or not. As currently restricted, those species which make their nests with pieces of leaves or petals belong to the genus *Megachile* while those which use resin, mud, or other such material have been assigned to *Chalicodoma* Lepeletier and *Creighttonella* Cockerell. The latter genus does not occur in the Western Hemisphere. Some authors have concluded that *Chelostomoides* Robertson warrants generic rank rather than subgeneric status within the genus *Chalicodoma* as it is treated here.

Revision: Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 295-361, pls. XX-XXI (Part I, classification of Nearctic subgenera including key; n. spp.). — Mitchell, 1935. Amer. Ent. Soc., Trans. 61: 1-44, pl. I (Part II, treats Nearctic spp. of subgenera *Cressoniella*, *Litomegachile*, *Neomegachile*). — Mitchell, 1935. Ent. Soc. Amer., Trans. 61: 155-205, pls. VIII-IX (Part III, treats Nearctic spp. of the subgenera *Anthemois* and *Delomegachile*). — Mitchell, 1936. Amer. Ent. Soc., Trans. 62: 117-166, pls. VIII-XI (Part IV, treats Nearctic spp. of the subgenera *Derotropis*, *Megachiloides*, *Phaenoserus*, and *Xanthoserus*). — Mitchell, 1937. Amer. Ent. Soc., Trans. 62: 323-382, pls. XXII-XXVI (Part V, treats Nearctic spp. of the subgenus *Xeromegachile*). — Mitchell, 1937. Amer. Ent. Soc., Trans. 63: 45-83, pls. V-VI (Part VI, treats Nearctic spp. of the subgenera *Acenatron*, *Argyropile*, *Leptorachis*, *Melanosarus* and *Pseudocentron*). — Mitchell, 1937.

Amer. Ent. Soc., Trans. 63: 175-206, pls. XII-XIII (Part VII, treats Nearctic spp. of the subgenus *Sayapis*). — Mitchell, 1937. Amer. Ent. Soc., Trans. 63: 381-426, pls. XXVI-XXXIX (Part VIII, treats Nearctic spp. of the subgenus *Chelostomoides*; addenda and index to Parts I-VIII).

Taxonomy: Michener, 1962. N. Y. Ent. Soc., Jour. 70: 17-29 (classification). — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 108-191, figs. 1, 36-62, tables 5-6 (eastern U. S. spp.). — Pasteels, 1965. Mus. Royal P. Afrique Centr., Ann. Sci. Zool. 137: ix, 579 pp. (classification). — Butler, 1965. Ariz. Agr. Expt. Sta. Tech. Bul. 187: 1-19 (Ariz. spp.). — Michener, 1965. Amer. Mus. Nat. Hist., Bul. 130: 185-186 (classification). — Medler and Lussenhop, 1968. Wis. Univ. Res. Bul. 274: 1-80 (Wis. spp.). — Stephen, Bohart and Torchio, 1969. The biology and external morphology of bees, pp. 53-54 (classification).

Biology: Hobbs and Lilly, 1954. Ecology 35: 453-462 (alfalfa pollination in southern Alberta). — Krombein, 1967. Trap-nesting wasps and bees, pp. 320-337, pl. 19, figs. 92-97; pl. 20, figs. 98-100 (life histories, nest associates). — Holm and Skou, 1972. Ent. Scandinavica 3: 169-180, 6 figs., 8 tables (nesting habits, parasites). — Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 37-38 (*Larrea* visiting spp.).

Morphology: Mitchell, 1935. Amer. Ent. Soc., Trans. 61: 3-9 (male sternites and genital armature). — Pasteels and Pasteels, 1971. Acad. Sci. Paris, Compt. Rend. 273: 1481-1483 (tergal glands).

### Genus MEGACHILE Subgenus LITOMEGACHILE Mitchell

*Megachile* subg. *Litomegachile* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 301, 308.

Type-species: *Megachile brevis* Cresson. Orig. desig.

*brevis brevis* Say. U. S. and south. Canada. Ecology: Nests in a wide variety of situations including within dead plant stalks of *Ambrosia trifida*, *Cirsium*, *Helianthus annuus*, *H. tuberosa*, *Vernonia interior*, *Zea mays*, in a rolled leaf of *Eupatorium perfoliatum*, among green leaves of *Erigeron canadensis*, among rocks and under dried cow chips, in a termite tunnel, and in various burrows and holes in the soil. Parasite: *Anthrax irroratus* Say, *Coelioxys novomexicana* Ckll., *C. octodentata* Say, *C. salinaria* Ckll., *C. sayi* Robt., *Leucospis affinis* Say, *Nemognatha nigripennis* Lec. Pollen: Polylectic, visits a wide variety of flowers especially Compositae, Leguminosae and Labiatae; visitation records include *Abutilon*, *Acerates*, *Althaea rosea*, *Amorpha*, *Apios*, *Asclepias eriocarpa*, *Aster canescens*, *Astragalus*, *Baptisia*, *Bidens laevis*, *Blephilia*, *Boltonia*, *Brauneria*, *Campanula*, *Cassia*, *Ceanothus*, *Cephalanthus*, *Chaenactis glabriuscula*, *Chamaecrista fasciculata*, *Chrysanthemum*, *Chrysothamnus*, *Cicuta*, *Clarkia botta*, *Convolvulus occidentalis*, *Coreopsis lanceolata*, *Cornus*, *Crotalaria*, *Croton californicus*, *Cryptantha intermedia*, *Cuscuta*, *Cynoglossum*, *Desmodium*, *Dianthera*, *Encelia farinosa*, *Engelmannia*, *Erechthites*, *Erigeron stenophyllus*, *Eryngium*, *Eupatorium*, *Fayopyrum*, *Frankenia grandiflora*, *Gaillardia pulchella*, *Galactia*, *Geranium maculatum*, *Gerardia*, *Gilia*, *Gossypium*, *Grindelia elata*, *Gutierrezia californica*, *G. sarothrae*, *Haplopappus palmeri*, *H. vernonioides*, *Heleium*, *Helianthus annuus*, *Heliopsis*, *Heliotropium curassavicum*, *Hemizonia fasciculata*, *Hieracium*, *Heterotheca grandiflora*, *Hibiscus*, *Hydrophyllum*, *Hypericum perfoliatum*, *Impatiens*, *Koellia*, *Krigia*, *Kuhnistera*, *Lactuca*, *Lepidospartum squamatum*, *Linaria*, *Lippia*, *Lobelia*, *Lotus scoparius*, *Lupinus parryi*, *Lycopus*, *Lythrum*, *Marrubium vulgare*, *Medicago sativa*, *Melilotus alba*, *Mentha piperita*, *Nepeta*, *Nutilla stricta*, *Oenothera*, *Onobrychis*, *Penstemon*, *Petalostemon compactus*, *Phacelia distans*, *P. heterophylla*, *P. ramosissima*, *Phascolus*, *Phyla lanceolata*, *P. nodiflora rosea*, *Physostegia*, *Pluchea camphorata*, *Polygala*, *Polygonum auberti*, *Psoralea*, *Psoralioides*, *Pycnanthemum*, *Rhus*, *Rosa*, *Rubus*, *Rudbeckia hirta*, *Ruellia*, *Sabatia*, *Sagittaria*, *Salix lasiolepis*, *Salvia*, *Schinus molle*, *Scutellaria*, *Senecio*, *Sidalcea reticulata*, *Silphium*, *Solidago canadensis*, *Sphaeralcea fasciculata*, *Stachys*, *Stephanomeria exigua*, *S. virgata*, *Strophostyles*, *Suriana*, *Tephrosia*, *Tecium*, *Tradescantia*, *Trifolium pratense*, *T. repens*, *Verbena*, *Verbesina*, *Vicia*.

*Megachile brevis* Say, 1837. Boston Jour. Nat. Hist. 1: 407. ♂, ♀.

*Megachile lanuginosa* Smith, 1853. Cat. Hym. Ins. Coll. Brit. Mus., v. 1, p. 190. ♀, ♂.

†*Megachile nupta* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 268. ♀.

*Megachile perbrevis* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 127. ♂.

Taxonomy: Michener, 1953. Kans. Univ. Sci. Bul. 35: 1057, figs. 151-153, 157 (larva).

—Michener, 1953. Kans. Univ. Sci. Bul. 35: 1663 (tax. status).

Biology: Rau, 1922. Acad. Sci. St. Louis, Trans. 24: 39 (nesting habits). —Rau, 1934. Acad. Sci. St. Louis, Trans. 28: 220 (nesting habits). —Rockwood, 1951. Pan-Pacific Ent. 27: 155 (nest, parasite). —Michener, 1953. Kans. Univ. Sci. Bul. 35: 1659-1748, 31 figs. (life history, nest and associates). —Donahue, 1954. Nature Mag. 47: 300-302 (life history). —Medler and Lussenhop, 1968. Wis. Univ. Res. Bul. 274: 19-20 (life history, parasites).

**brevis onobrychidis** Cockerell. Southwest. U. S., intergrading with typical *brevis* Say in a wide area from Nebr. and Tex. to Pacific Coast from Calif. to B. C. and Idaho. Ecology: Uses grape leaves for nesting material. Parasite: *Coelioxys octodentata* Say. Pollen: Polylectic, visits a wide variety of flowers especially Compositae, Leguminosae and Labiatae, visitation records include *Achillea lanulosa*, *A. millefolium*, *Agastache*, *Asclepias eriocarpa*, *A. mexicana*, *Bigelovia*, *Brassica geniculata*, *Calochortus luteus*, *C. venustus*, *Calycadenia multiglandulosa*, *Calyptidium umbellatum*, *Centaurea solstitialis*, *Cercidium*, *Chamaebatia foliolosa*, *Chrysothamnus nauseosus speciosus*, *C. viscidiflorus typicus*, *Cirsium californicum*, *Clarkia dudleyana*, *C. speciosa speciosa*, *C. unguiculata*, *Cleome obtusifolia*, *Convolvulus aridus*, *Cordylanthus filifolius*, *C. pilosus*, *Coreopsis lanceolata*, *Corethrogyne bernardina*, *Crepis vesicaria*, *Croton californicus*, *Cryptantha intermedia*, *Eriastrum virgatum*, *Erigeron canadensis*, *Eriodictyon*, *Eriogonum fasciculatum*, *E. gracile*, *E. latifolium* var. *nudum*, *Eryngium aristatum*, *Eschscholzia californica*, *Foeniculum vulgare*, *Frankenia grandiflora*, *Grindelia camporum*, *G. hallii*, *Gutierrezia californica*, *G. lucida*, *G. sarothrae*, *Haplopappus arborescens*, *H. bloomeri* var. *angustatus*, *H. pachylepis*, *H. palmeri*, *H. venetus*, *Helenium*, *Helianthus*, *Heliotropium curassavicum*, *Hemizonia fasciculata*, *H. luzulaefolia*, *H. pungenis*, *H. wrightii*, *Heterotheca grandiflora*, *Hoffmanseggia microphylla*, *Lotus americanus*, *L. glaber*, *L. hamatus*, *L. humistratus*, *L. purshianus*, *L. scoparius*, *L. strigosus*, *Lupinus micranthus*, *Lythrum californicum*, *Malacothamnus arcuatus*, *Marrubium vulgare*, *Medicago sativa*, *Melilotus alba*, *M. indica*, *Mimulus brevipes*, *Onobrychis*, *Phacelia distans*, *P. ramosissima*, *Phyla lanceolata*, *P. nodiflora* var. *rosea*, *Polygonum aubertii*, *Ribes*, *Rudbeckia serotina*, *Prosopis*, *Salix*, *Salvia clevelandii*, *Sida hederacea*, *Solidago californica*, *S. occidentalis*, *Spiraea*, *Stanleya pinnata*, *Stephanomeria exigua*, *S. virgata*, *Trichostema lanceolatum laxum*, *T. parishii*, *T. repens*, *T. variegatum*, *Verbena lasiostachys*, *Wislizenia refracta*.

*Megachile onobrychidis* Cockerell, 1908. Ann. and Mag. Nat. Hist. (8) 1: 266. ♂.

Taxonomy: Michener, 1953. Kans. Univ. Sci. Bul. 35: 1663 (tax. status).

**brevis pseudobrevis** Mitchell. N. C. to Fla. and Miss. Pollen: Presumably polylectic, visits flowers of *Azelia*, *Chrysopsis*, *Crotalaria*, *Erigeron*, *Galactia*, *Gaylussacia*, *Helenium*, *Helianthus*, *Lupinus*, *Melilotus*, *Opuntia*, *Polygonum*, *Rhus*, *Rubus*, *Solidago*, *Suriana*, *Trilisa*, *Vaccinium*.

*Megachile* (*Litomegachile*) *brevis* var. *pseudobrevis* Mitchell, 1936. Amer. Ent. Soc., Trans. 61: 20. ♀, ♂.

Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 116 (tax. status).

**coquilletti** Cockerell. Idaho and Utah, west to B. C. to south. Calif. and Ariz. Pollen:

Apparently polylectic, visits a wide variety of flowers including *Asclepias erosa*, *A. mexicana*, *A. speciosa*, *Baccharis*, *Brassica geniculata*, *B. incana*, *Brodiaea crocea*, *Centaurea solstitialis*, *Cercidium torreyanum*, *Cirsium vulgare*, *Clarkia unguiculata*, *Cleome serrulata*, *Cordylanthus pilosus*, *C. rigidus*, *Croton californicus*, *Cryptantha intermedia*, *Eriastrum virgatum*, *Erigeron stenophyllus*, *E. elatum*, *E. fasciculatum* var. *polifolium*, *E. latifolium* var. *nudum*, *E. plumatella*, *Eriophyllum confertiflorum*, *Frasera parryi*, *Grindelia*, *Gutierrezia sarothrae*, *Helianthus gracilentus*, *Lotus americanus*, *L. glaber*, *L. scoparius*, *Marrubium vulgare*, *Medicago sativa*, *Melilotus alba*, *Phacelia ramosissima*, *Pluchea camphorata*, *Phyla filiformis*, *P. lanceolata*, *Rhamnus californicus*, *Solidago*, *Svertia parryi*.

*Megachile mendica coquilletti* Cockerell, 1915. Ann. and Mag. Nat. Hist. (8) 15: 535. ♂.



*gentilis* Cresson. Tex. to Calif., Nev., Oreg. and Idaho, adventive and established in Hawaii.

Ecology: Nests in twigs of *Sambucus* and also in trap-nests. Parasite: *Anthrax atriplex* Marston, *A. daphne* (O. S.), *A. irroratus* Say, *A. melanopogon* (Bigot), *Aritranis notata sierrae* Townes, *Coelioxys noromericana* Ckll., *Leucospis affinis* Say, *Tetrastichus megachilidis* Burks. Pollen: Apparently polylectic, visits flowers of *Acacia*, *Amorpha fruticosa*, *Asclepias erosa*, *A. speciosa*, *Aster canescens*, *A. spinosus*, *Begonia*, *Baccharis*, *Brassica geniculata*, *B. incana*, *Cercidium*, *Cereus engelmannii*, *Chamaebatia foliolosa*, *Chrysopsis fastigiata*, *Chrysanthamnus*, *Clarkia amoena*, *C. dudleyana*, *C. unguiculata*, *Clematis*, *Cleomella obtusifolia*, *Collinsia tinctoria*, *Condalia*, *Cordylanthus filifolius*, *C. nevini*, *C. pilosus*, *C. rigidus*, *Croton californicus*, *Cryptantha intermedia*, *Dalea*, *Echinocactus*, *Erigeron stenophyllus*, *Eriogonum fasciculatum*, *E. gracile*, *E. latifolium* var. *nudum*, *Eriophyllum confertiflorum*, *Grindelia camporum*, *Gutierrezia sarothrae*, *Haplopappus acradeniis*, *H. arborescens*, *H. bloomeri* var. *angustatus*, *H. vernonioides*, *Helenium bigelovii*, *Helianthus annuus*, *Hemizonia pungens*, *Heteromeles arbutifolia*, *Heterotheca grandiflora*, *Hyptis emoryi*, *Larrea tridentata*, *Lathyrus splendens*, *Lepidium*, *Lessingia glandulifera*, *Lippia*, *Lotus argophyllus*, *L. glaber*, *L. heermannii*, *L. nevadensis*, *L. purshianus*, *Lupinus longipes*, *Marrubium vulgare*, *Medicago sativa*, *Melilotus alba*, *M. indica*, *Monarda citriodora*, *Nolina parryi*, *Opuntia*, *Phacelia distans*, *P. heterophylla*, *P. ramosissima*, *Phyla nodiflora* var. *rosea*, *Pluchea camphorata*, *Polygonum*, *Prosopis*, *Ratibida columnaris*, *Rhmannus californica*, *Sapindus*, *Senecio douglasii*, *Sisymbrium altissimum*, *Solidago confinis*, *S. occidentalis*, *Spraguea umbellatum*, *Swerdia neglecta*, *Trifolium repens*, *T. variegatum*, *Vauquelinia*, *Verbena lasiostachys*, *Verbesina*, *Viguiera multiflora*, *Wislizenia refracta*. Predator: *Trichodes horni* Wolcott and Chapin.

*Megachile gentilis* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 267. ♂.

*Megachile palmarum* Perkins, 1899. Fauna Hawaii, v. 1, p. 114. ♂, ♀.

*Megachile murinella* Cockerell, 1908. Ann. and Mag. Nat. Hist. (8) 1: 263. ♀.

Biology: Bechtel, 1958. Pan-Pacific Ent. 34: 12 (nest, parasite). — Krombein, 1967.

Trap-nesting wasps and bees, pp. 320-321, pl. 20, figs. 99-100 (nest architecture, life history, supersedure, parasites, predator).

*lipipiae* Cockerell. Mont., Nebr., Tex., west to Utah and Calif. Ecology: Uses cuttings from rose leaves for nest material. Pollen: Apparently polylectic, visits a wide variety of flowers including *Acacia*, *Agave*, *Althaea rosea*, *Amorpha*, *Asclepias*, *Aster*, *Baccharis*, *Cercidium*, *Cirsium*, *Cucurbita*, *Erigeron*, *Eriogonum fasciculatum* var. *polifolium*, *Haplopappus*, *Helenium*, *Helianthus*, *Hoffmanseggia*, *Hyptis emoryi*, *Larrea tridentata*, *Lippia*, *Lotus*, *Marrubium vulgare*, *Medicago*, *Melilotus*, *Mortonia*, *Nama*, *Nolina*, *Opuntia*, *Petalostemon*, *Prosopis*, *Sapindus*, *Sphaeralcea*, *Symphoricarpos*, *Trifolium*, *Verbesina*.

*Megachile cleomis* var. *lipipiae* Cockerell, 1900. Ann. and Mag. Nat. Hist. (7) 6: 15. ♀, ♂.

Biology: Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 37 (floral relationship with *Larrea*).

*mendica mendica* Cresson. Ont. and Maine to Fla., west to S. Dak., Colo., Ariz. and Calif.

Ecology: Nests in rose canes and trap nests. Parasite: *Coelioxys octodentata* Say, *C. sayi* Robt., *Melittobia chalybii* Ashm., *Physocephala marginata* (Say). Pollen: Polylectic, visits a wide variety of flowers, especially Compositae, Leguminosae, and Labiatae; visitation records include *Acerates*, *Agastache*, *Amorpha*, *Apios*, *Aralia*, *Asclepias tuberosa*, *Aster*, *Baptisia*, *Bidens*, *Blephilia*, *Boltonia*, *Borrichia*, *Brassica nigra*, *Brauneria*, *Buddleia campanula*, *Camassia*, *Cassia*, *Ceanothus*, *Cephalanthus*, *Chaemaecrista*, *Chrysanthemum*, *Chrysopsis*, *Cicuta*, *Cirsium*, *Clematis*, *Cleomella obtusifolia*, *Clethra*, *Conoclinium caelestinum*, *Coreopsis stellata*, *Cosmos*, *Crataegus*, *Crotalaria*, *Cyrtilla*, *Daucus*, *Desmodium*, *Diospyros*, *Elephantopus carolinianus*, *Erigeron*, *Eriogonum*, *Eryngium*, *Eupatorium*, *Flaveria*, *Galactia*, *Gaucha*, *Gaylussacia*, *Geranium*, *Haplopappus*, *Helenium*, *Helianthus*, *Heliopsis helianthoides*, *Hypericum*, *Ilex*, *Impatiens*, *Itea*, *Koelia mutica*, *Lepachys*, *Lespedeza*, *Linaria*, *Lupinus*, *Lycopus*, *Lythrum*, *Marrubium vulgare*, *Medicago*, *Melilotus alba*, *Monarda*, *Nepeta*, *Nyssa*, *Ocimum*, *Oenothera*, *Opuntia*, *Phacelia*, *Phaseolus*, *Polygala incarnata*, *Polygonum*,

*Prunella*, *Psedera*, *Psoralea*, *Pycnanthemum*, *Pyrrhopappus*, *Rhus*, *Richardia*, *Robinia*, *Rosa*, *Rubus*, *Rudbeckia*, *Salix*, *Senecio*, *Silphium*, *Solidago*, *Specularia*, *Spiraea*, *Stachys*, *Strophostyles*, *Suriana*, *Symphoricarpos*, *Tephrosia*, *Teucrium*, *Trifolium*, *Trilisia*, *Vaccinium*, *Verbena*, *Verbesina*, *Vernonia glauca*, *Veronica*, *Veronicastrum virginicum*, *Vicia*, *Zinnia*, *Zizia*. Predator: *Pymotes ventricosus* (Newport), *Vidia* sp. *Megachile mendica* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 126. ♀.

Taxonomy: Rau, 1922. Acad. Sci. St. Louis, Trans. 24: 39 (life history).

Biology: Koerber and Medler, 1959. Wis. Acad. Sci., Arts and Letters 47: 56 (geogr. records). —Medler, 1965. Ent. Soc. Wash., Proc. 67: 113-116, 1 table (life history, nest architecture, cocoon, parasites). —Krombein, 1967. Trap-nesting wasps and bees, pp. 322-325 (life history, nest architecture, supersedure, parasites, predators). —Medler and Lussenhop, 1968. Wis. Univ. Res. Bul. 274: 25-26 (nesting habits).

**mendica snowi** Mitchell. Colo., N. Mex., Ariz. Pollen: Apparently polylectic, visits flowers of *Asclepias*, *Ceanothus*, *Chilopsis*, *Cleome*, *Eriogonum*, *Geranium*, *Gilia*, *Helenium*, *Heliopsis*, *Heterotheca*, *Ligustrum*, *Lupinus*, *Marrubium vulgare*, *Melilotus*, *Robinia*, *Rudbeckia*, *Verbesina*, *Viguiera*.

*Megachile mendica snowi* Mitchell, 1927. Psyche 34: 113. ♀.

**texana** Cresson. Que. to Fla., west to B. C. and Calif. Ecology: Nests in preexisting holes in the ground. Parasite: *Coelioxys moesta* Cress., *C. octodentata* Say, *C. rufitarsis* Sm., *C. sodalis* Cress. Pollen: Polylectic, visits a wide variety of flowers especially Leguminosae, Compositae, and Labiatae, but also commonly takes pollen from *Larrea tridentata* (Zygophyllaceae) in the southwestern U. S.; visitation records include *Acacia greggii*, *Acerates*, *Achillea lanulosa*, *Azalia*, *Agave deserti*, *Althaea rosea*, *Alyssum maritimum*, *Apocynum androsaemifolium*, *Amorpha fruticosa*, *Asclepias galioides*, *A. mexicana*, *A. speciosa*, *Aster*, *Baccharis emoryi*, *Baptisia*, *Berberis*, *Blephilia*, *Buddleia*, *Calycadenia multiglandulosa*, *Chamaecrista fasciculata*, *Chrysothamnus*, *Cirsium*, *Clematis ligusticifolia*, *Clethra*, *Convolvulus*, *Cordylanthus nevadensis*, *Coreopsis*, *Crotalaria*, *Croton californicus*, *Cryptantha*, *Dianthera*, *Elephantopus carolinianus*, *Eriastrum virgatum*, *Eriogonum elongatum*, *E. fasciculatum*, *E. latifolium* var. *nudum*, *E. subcaposum*, *E. wrightii*, *Erigeron coulteri*, *Eupatorium*, *Euphorbia*, *Fraseria parryi*, *Galactia*, *Gilia inconspicua*, *Gutierrezia sarothrae*, *Haplopappus*, *Helenium*, *bigelovii*, *Helianthus*, *Hypericum*, *Hyptis emoryi*, *Kuhnistera oligophylla*, *Larrea tridentata*, *Liatris*, *Lotus nevadensis*, *L. scoparius*, *Lupinus longipes*, *Marrubium vulgare*, *Medicago sativa*, *Melilotus alba*, *Monardella lanceolata*, *Nepeta*, *Nolina*, *Opuntia*, *Oxydendron*, *Penstemon*, *Petalostemon candidum*, *Phacelia heterophylla*, *Phaseolus*, *Phyla nodiflora*, *Pluchea camphorata*, *Polygala*, *Polygonum aubertii*, *Psoralea*, *Pycnanthemum*, *Pyrrhopappus*, *Rhamnus californica*, *Rhus*, *Rubus*, *Sapindus*, *Schinus molle*, *Serinea*, *Silphium*, *Solidago californica*, *S. confinis*, *Stachys*, *Stanleya pinnata*, *Strophostyles*, *Tamarix*, *Tephrosia*, *Trifolium*, *Verbena*, *Vicia*, *Viguiera laciniata*.

*Megachile texana* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 125. ♂ (♀ misdet.).

*Megachile generosa* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 125. ♀.

*Megachile schismatura* Cockerell, 1908. Ann. and Mag. Nat. Hist. (8) 1: 267. ♂.

*Megachile cleonis* Cockerell, 1900. Ann. and Mag. Nat. Hist. (7) 6: 13. ♀, ♂.

*Megachile pruinosa* Friese, 1903. Ztschr. System. Hym. Dipt. 3: 246. ♀, ♂. Preocc.

*Megachile vernalensis* Cockerell, 1912. Canad. Ent. 44: 354. "♀" = ♂.

Biology: Rau, 1922. Acad. Sci. St. Louis, Trans. 24: 38 (nest, as *generosa*). —Hicks, 1926. Colo. Univ. Studies 15: 228 (nest, as *cleonis*). —Krombein, 1953. Ent. Soc. Wash., Proc. 55: 84-85 (nest). —Medler and Lussenhop, 1968. Wis. Univ. Res. Bul. 274: 30 (nest). —Krombein, 1970. Ent. Soc. Wash., Proc. 72: 415 (nest). —Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 37-38 (floral relationships).

#### Genus MEGACHILE Subgenus NEOMEGACHILE Mitchell

*Megachile* subg. *Neomegachile* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 302, 307.

Type-species: *Megachile chichimeca* Cresson. Orig. desig.

*aegra* Mitchell. South. Tex., south to Brazil.

*Megachile aegra* Mitchell, 1930. Amer. Ent. Soc., Trans. 56: 283. ♂.

*chichimeca* Cresson. South. Tex.; Mexico.

*Megachile chichimeca* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 130. ♀.

*Megachile disparipennis* Cockerell, 1917. In W. P. Cockerell, N. Y. Ent. Soc., Jour. 25: 192. ♀.

#### Genus MEGACHILE Subgenus CRESSONIELLA Mitchell

*Megachile* subg. *Cressoniella* Mitchell, 1943. Amer. Ent. Soc., Trans. 59: 302, 307.

Type-species: *Megachile zapoteca* Cresson. Orig. desig.

*zapoteca* Cresson. South. Ariz., south to Costa Rica. Pollen: Unknown, but visits flowers of

*Asclepias*, *Helenium*, *Helianthus*, *Lathyrus*, *Melilotus*, *Monarda*.

*Megachile zapoteca* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 128. ♀.

*Megachile tuxtla* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 128. ♂.

#### Genus MEGACHILE Subgenus MEGACHILE Latreille

*Megachile* Latreille, 1802. Hist. Nat. Formis, p. 413, 433.

Type-species: *Apis centuncularis* Linnaeus. Desig. by Curtis, 1828.

*Anthophora* Fabricius, 1804. Systema piezatorum, p. 372. Preocc.

Type-species: *Apis centuncularis* Linnaeus. Desig. by Michener, 1951.

*Anthemois* Robertson, 1903. Amer. Ent. Soc., Trans. 29: 168.

Type-species: *Apis centuncularis* Linnaeus. Monotypic and orig. desig. (= *Megachile infragilis* Cresson).

*Cyphopyga* Robertson, 1903. Amer. Ent. Soc., Trans. 29: 169.

Type-species: *Megachile montivaga* Cresson. Monotypic and orig. desig.

*Megalochila* Schulz, 1906. Spolia Hym., p. 64. Emend.

*centuncularis* (Linnaeus). Holarctic, in America principally northern, but occurs south to Fla.

Mo., Colo., Nev., Ariz. Ecology: Nests both below and above ground in preexisting holes or cavities. Parasite: *Coelioxys modesta* Sm., *C. moesta* Cress., *C. octodentata* Say, *Dibrachys* sp., *Melittobia chalybii*, *M. megachilidis* (Pack.), *Monodontomerus montivagus* Ashm., *Ptinus* sp. nr. *hirtellus* Sturm. Pollen: Apparently polylectic, visits a wide variety of flowers, especially Compositae and Leguminosae; visitation records include *Althaea rosea*, *Aster*, *Carduus undulatus*, *Centaurea cyanus*, *C. jacea*, *Epilobium angustifolium*, *Fendlera*, *Gladiolus*, *Grindelia squarrosa*, *Helianthus annuus*, *H. maximilianus*, *Inula helenium*, *Medicago sativa*, *Melilotus alba*, *M. officinalis*, *Psoralea*, *Pyraecantha*, *Sedum*, *Solidago*, *Taraxacum taraxacum*, *Trifolium*, *Vernonia fasciculata*, *Zinnia*.

*Apis centuncularis* Linnaeus, 1758. Syst. Nat., Ed. 10, p. 575. ♀.

*Apis rotundata* Fabricius, 1787. Mantissa Insectorum, v. 1, p. 303. ♂.

*Megachile infragilis* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 127. ♂.

*Megachile leoni* Titus, 1906. Ent. Soc. Wash., Proc. 7: 150. ♀.

*Perezia maura* Ferton, 1914. Soc. Ent. France, Ann. 83: 233. Intersex.

Taxonomy: Hurd, 1967. Ent. Medd. 35: 5-6 (synonymy). — Pasteels, 1969. Soc. Ent. France, Bul. 74: 248 (intersex, synonymy).

Biology: Gentry, 1874. Canad. Ent. 6: 171-175 (nest, supersedure). — Packard, 1874. Guide to the study of insects, 4th ed., pp. 136-137 (nest). — Hicks, 1926. Colo. Univ. Studies 15: 231 (nest, as *infragilis*).

— Michelbacher and Hurd, 1954. Pan-Pacific Ent. 20: 146 (nest, parasite). — Medler, 1959. Canad. Ent. 91: 113-115, 1 fig. (nest). — Krombein, 1967.

Trap-nesting wasps and bees, pp. 325-326 (life history, nest architecture, parasite).

— Medler and Lussenhop, 1968. Wis. Univ. Res. Bul. 274: 20-21 (life history, parasite).

— Holm and Skou, 1972. Ent. Scand. 3: 169-180, 6 figs., 8 tables (life history, nest

architecture, sex ratio, rate of emergence, parasite, diseases).

*inermis* Provancher. N. S. to Ga., west to B. C., south to Calif., Utah., Colo., N. Mex. and Tex.

Ecology: Nests in decaying poplar and in borings in wood. Parasite: *Coelioxys funeraria* Sm., *Dibrachys maculipennis* Szelenyi, *Leucospis affinis* Say. Pollen: Apparently

polylectic, especially Compositae and Leguminosae; visitation records include *Baptisia tinctoria*, *Carduus undulatus*, *Inula helenium*, *Lathyrus venosus*, *Medicago sativa*, *Nepeta cararia*, *Penstemon*, *Polymnia uvedalia*, *Rhododendron*, *Rubus strigosus*, *R. villosus*, *Sanicula marylandica*, *Taraxacum officinale*, *Tephrosia virginiana*, *Vernonia*.  
*Megachile simplex* Provancher, 1882. Nat. Canad. 13: 229. ♂. Preocc.  
*Megachile inermis* Provancher, 1888. Addit. Corr. Faune Ent. Canada, Hym., p. 323. ♂.  
*Megachile simplicissima* Dalla Torre, 1896. Cat. Hym., v. 10, p. 449. N. name.  
*Megachile sapellonis* Cockerell, 1900. Ann. and Mag. Nat. Hist. (7) 6: 7. ♀.  
*Megachile temporalis* Friese, 1903. Ztschr. System. Hym. Dipt. 3: 247. ♂ (♀ misdet.).  
*Megachile decipiens* Lovell and Cockerell, 1907. Psyche 14: 19. ♂.

Taxonomy: Titus, 1906. Ent. Soc. Wash., Proc. 7: 150 (synonymy).

Biology: Stephen, 1955. Econ. Ent., Jour. 48: 543 (effectiveness as pollinator of alfalfa).  
 —Stephen, 1956. Pan-Pacific Ent. 32: 98-101 (nest). —Koeber and Medler, 1958. Wis. Acad. Sci., Arts and Letters 47: 56 (life history). —Medler, 1958. Canad. Ent. 90: 325-327, 1 fig. (life history). —Medler, 1958. Ent. News 66: 21 (parasite). —Fye, 1965. Canad. Ent. 97: 874-875, tables 2-4 (life history, nest architecture, sex ratio, parasite). —Medler and Lussenhop, 1968. Wis. Univ. Res. Bul. 274: 22-23 (life history, parasite).

**montivaga** Cresson. N. S. to N. C., west to B. C. and Calif.; Mexico. Ecology: Uses petals of *Clarkia* for nest construction. Parasite: *Coelioxys insita* Cress., *C. rufitarsis* Sm., *Leucospis affinis* Say, *Nemognatha dubia* LeC., *Phaenocarpa* sp. Pollen: Polylectic, especially Compositae, visits flowers of *Argemone intermedia*, *A. platyceros*, *Asclepias*, *Aster parishii*, *Blephilia*, *Brauneria*, *Campanula*, *Carduus undulatus*, *Centaurea jacea*, *C. solstitialis*, *Chaenactis artemisiaefolia*, *Chilopsis linearis*, *Chrysopsis villosa*, *Chrysanthamnus*, *Cirsium californicum*, *C. lanceolatum*, *Clarkia amoena huntiana*, *C. biloba*, *C. cylindrica*, *C. dudleyana*, *C. elegans*, *C. rubicunda*, *C. unguiculata*, *C. viminea*, *C. williamsoni*, *Cleome*, *Convolvulus occidentalis*, *Coreopsis stellata*, *Cryptantha intermedia*, *Dianthera*, *Echinacea*, *Epilobium*, *Euphorbia albomarginata*, *Geranium maculatum*, *Gilia*, *Grindelia camporum*, *G. hallii*, *Gutierrezia*, *Haplopappus bloomeri* var. *angustatus*, *Hedonia*, *Helenium bigelovii*, *Helianthus annuus*, *H. gracilentus*, *Iris hartwegii*, *Lactuca*, *Lotus scoparius*, *Marrubium vulgare*, *Medicago sativa*, *Melilotus*, *Monarda*, *Monardella*, *Oenothera*, *Opuntia*, *Palafoxia linearis*, *Parthenium*, *Penstemon*, *Phacelia*, *Polymnia uvedalia*, *Rosa*, *Rudbeckia*, *Salix*, *Salvia carduacea*, *S. mellifera*, *Scrophularia*, *Senecio douglasii*, *Sidalcea*, *Silphium*, *Solidago*, *Trifolium*, *Verbena lasiostachys*, *Verbesina encelioides*, *Vernonia*, *Viguiera laciniata*, *V. multiflora*.

*Megachile montivaga* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 124. ♀, ♂.

Biology: Hicks, 1926. Colo. Univ. Studies 15: 232 (nest).

**ivalis** Friese. Alaska, south to Oreg., east to Que. and Maine. Parasite: *Anthrax irroratus* Say. Pollen: Unknown, but visits flowers of *Elaeagnus*, *Taraxacum*.

*Megachile ivalis* Friese, 1903. Ztschr. System. Hym. Dipt. 3: 246. ♀ (♂ misdet.).

*Megachile (Anthemois) santiamensis* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 311. ♀.

Taxonomy: Mitchell, 1942. Pan-Pacific Ent. 18: 115. ♂, ♀.

**relativa** Cresson. Mackenzie to Newfoundland, south to Calif., Ariz., Ill., Tenn., and Ga.

Ecology: Nests in borings in wood. Parasite: *Coelioxys banksi* Cwfd., *C. funeraria* Say, *C. modesta* Sm., *C. moesta* Cress., *C. porterae* Ckll., *Dibrachys maculipennis* Szelenyi, *Leucospis affinis* Say, *Melittobia chalybii* Ashm., *Pteromalus venustus* Walker. Pollen: Apparently polylectic, visits flowers of *Amorpha*, *Apocynum*, *Aster puniceus*, *A. umbellatus*, *Baptisia*, *Besseyia plantagineae*, *Brassica*, *Chamaenerion angustifolium*, *Chrysanthemum leucanthemum*, *Epilobium*, *Erigeron coulteri*, *Frasera*, *Geranium*, *Gilia*, *Houstonia*, *Iris*, *Melilotus*, *Mertensia*, *Phacelia*, *Physalis*, *Prenanthes*, *Ranunculus*, *Rhodora*, *Rosa*, *Rubus*, *Rudbeckia hirta*, *Senecio subnudus*, *Solidago*, *Trifolium*, *Valeriana*.

*Megachile relativa* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 126. ♀.

*Megachile (Xanthosarus) exclamans* Viereck, 1916. Conn. State Geol. and Nat. Hist. Survey, Bul. 22: 743. ♀.

*Megachile aspera* Mitchell, 1924. Elisha Mitchell Sci. Soc., Jour. 40: 158. ♀.

Biology: Medler and Koerber, 1958. Ent. Soc. Amer., Ann. 51: 337-344, 3 figs. (life history, parasite). — Koerber and Medler, 1958. Wis. Acad. Sci., Arts and Letters 47: 56 (life history, parasite).

**Genus MEGACHILE Subgenus EUTRICHARAEA Thomson**

*Megachile* subg. *Eutrigharaea* Thomson, 1872. Hym. Scand., v. 2, p. 228.

Type-species: *Apis argentata* Fabricius. Monotypic.

*Megachile* subg. *Paramegachile* Friese, 1898. Termesz. Fus. 21: 198.

Type-species: *Apis argentata* Fabricius. Desig. by Mitchell, 1934.

*Megachile* subg. *Paramegalochila* Schulz, 1906. Spolia Hym., p. 71. Emend.

*Androgynella* Cockerell, 1911. Ann. and Mag. Nat. Hist. (8) 7: 313.

Type-species: *Megachile detera* Cockerell. Monotypic and orig. desig.

*Megachile* subg. *Neoeutrigharaea* Rebmman, 1967. Ent. Ztschr. (N. S.) 17: 36.

Type-species: *Megachile rotundata* (F.). Orig. desig. (name of type-species placed originally in quotation marks).

Taxonomy: Rebmman, 1967. Ent. Ztschr. (n. s.) 77: 33-38. — Hurd, 1967. Ent. Medd. 35: 3-10.

— Rebmman, 1967. Deut. Ent. Ztschr. (n. s.) 15: 21-48. — Rebmman, 1967. Ent. Ztschr. 77: 169-171.

Biology: Parker, Torchio, Nye and Pedersen, 1976. Jour. Apicult. Res. 15: 89-92 (field-cage studies).

**apicalis** Spinola. Canada, N. J., Va. Presumably introduced from Europe. Pollen: Unknown, but visits flowers of *Centaurea cyanus*.

*Megachile apicalis* Spinola, 1808. Insectorum Liguria, v. 2, p. 259. ♀.

*Megachile mixta* Costa, 1863. Accad. delle Sci. Fis. e Mat. Napoli, Atti 1 (2): 44. ♀.

*Megachile dimidiati-ventris* Dours, 1873. Rev. Mag. Zool. (3) 1: 300. ♀.

*Megachile virginiana* Mitchell, 1926. Amer. Ent. Soc., Trans. 52: 113. ♀.

**concinna** Smith. Holarctic; Pa. and Ohio south to Fla. and Ala., Kans., Okla., Nev., Calif., Utah, Wash.; Mexico. Ecology: Nests in borings in wood. Presumably introduced from West Indies after World War II and was probably introduced from Africa into the West Indies during the early part of the nineteenth century. Parasite: *Anthrax cinctalapa* Cole, *Coelioxys moesta* Cress., *Nemognatha lurida* LeC., *Tetrastichus megachitidis* Burks. Pollen: Polylectic, visits a variety of native and introduced flowers including *Acacia*, *Asclepias*, *Aster*, *Baccharis*, *Bidens*, *Centromadia pungens*, *Citrus*, *Croton californicus*, *Euphorbia albomarginata*, *Heliotropium curassavicum*, *Hemizonia pungens*, *Ipomoea*, *Lepidium*, *Lippia*, *Lotus purshianus*, *Medicago sativa*, *Melilotus alba*, *M. indica*, *Onobrychis viciaefolia*, *Polygonum aubertii*, *Prosopis*, *Raphanus sativus*, *Senecio*, *Sicyos*, *Tamarix*, *Trifolium repens*, *Vernonia*, *Wislizenia refracta*. Predator: *Trogoderma* sp.

*Megachile concinna* Smith, 1879. Descr. n. spp. Hym., p. 79. ♀.

Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 121-122, fig. 39 (redescription, other possible synonyms).

Biology: Butler and Wargo, 1963. Pan-Pacific Ent. 39: 201-206, 1 fig. (life history, nest architecture, parasite, predator). — Butler and Ritchie, 1965. Pan-Pacific Ent. 41: 153-157 (life history, pollination). — Krombein, 1967. Trap-nesting wasps and bees, pp. 326-327 (life history, nest architecture, predator).

**pacifica** (Panzer). Holarctic; Mass. to Va., west to B. C., Wash., Oreg. and Calif. Ecology: Nests in borings in wood as well as in a wide variety of native and artificial burrows. Presumably introduced some time during or just after World War II; also adventive in S. Amer. (Chile and Argentina). Parasite: *Coelioxys funeraria* Sm., *C. gilensis* Ckll., *C. moesta* Cress., *C. novomexicana* Ckll., *C. octodentata* Say, *C. sodalis* Cress., *Dibrachys maculipennis* Szelenyi, *Melittobia acasta* Walker, *M. hawaiiensis* Perkins, *Monodontomerus montivagus* Ashm., *M. obscurus* Westw., *Sapyga pumila* Cress., *Tetrastichus albipes* Crosby. Pollen: Polylectic, visits a wide variety of both native and introduced flowers and is an exceptionally valuable pollinator of alfalfa; visitation records include *Asclepias*, *Centromadia pungens*, *Cichorium intybus*, *Cosmos*,

*Euphorbia albomarginata*, *Heliotropium curassavicum* var. *oculatum*, *Lotus corniculatus*, *Medicago sativa*, *Melilotus alba*, *Phacelia ramosissima*, *Polygonum aubertii*, *Senecio douglasii*, *Solidago*, *Veronica*. The name adopted by the International Bee Research Association for this species is *Megachile pacifica* (Panzer); however, an application pending before the International Commission on Zoological Nomenclature requests that the Commission use its plenary powers to set aside all type selections for *Apis rotundata* Fabricius, 1793, and to rule that the species is to be interpreted by reference to a newly established neotype specimen. Thus, if the Commission rules affirmatively on this application, the correct name for this species will be *Megachile rotundata* (Fabricius) which is currently considered to be a synonym of *Megachile centuncularis* (Linnaeus) and is so treated in this catalog.

*Apis pacifica* Panzer, 1798. Faunae Ins. German., v. 55, p. 16. ♀.

*Megachile imbecilla* Gerstaecker, 1869. Stettin. Ent. Ztg. 30: 359. ♀.

Taxonomy: Krombein, 1948. Ent. Soc. Wash., Proc. 50: 14 (as *rotundata*). — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 122-124, figs. 38-39 (redescription, possible identity, as *rotundata*?). — Hurd, 1967. Ent. Medd. 35: 3-10 (tax. status of *rotundata* Fabr.). — Rebmann, 1967. Ent. Ztschr. 77: 169-171 (tax. status of *rotundata* Fabr. and *pacifica* Panz.). — Holm and Skou, 1972. Ent. Scand. 3: 169-170 (review of tax. status of *rotundata* Fabr. and *pacifica* Panz.). — Roberts, 1974. Zool. Nomencl., Bul. 30: 190-192 (proposed suppression of lectotype and designation of neotype in accord with *Megachile rotundata* auct.). — Anonymous, 1975. Bee World 56: 164 (identity problems, adoption by International Bee Research Association of *Megachile pacifica* (Panzer) as correct name for this species).

Biology: Daly, 1952. Ent. News 63: 210-211 (geogr. and floral records in midwest. U. S.). — Hurd, 1954. Ent. News 65: 93-95 (geogr. and floral records in Calif.). — Stephen and Torchio, 1961. Pan-Pacific Ent. 37: 85-93 (nest sites, emergence, cells, adult behavior, leaf-cuttings, larval development, historical notes). — Stephen, 1961. Econ. Ent. Jour. 54: 989-993 (artificial nest sites and propagation for alfalfa pollination). — Bohart, 1962. Utah Agr. Expt. Sta., Circ. 144: 1. (management for alfalfa pollination). — Stephen, 1962. Oreg. Agr. Expt. Sta., Bul. 586, 16 pp., 9 figs. (propagation for alfalfa seed production). — Johansen, Jaycox and Hutt, 1963. Wash. Agr. Expt. Sta., Circ. 418:1. (effect of pesticides). — Torchio, 1963. Utah Farm Home Sci. 24: 70-71 (parasite). — Nye and Bohart, 1964. Utah State Univ. Agr. Expt. Sta., Circ. 145: 1-7, 6 figs. (equipment for making nesting holes). — Stephen, 1965. XII. Int. Congr. Ent. London, Proc. p. 350 (circadian rhythms). — Stephen and Osgood, 1965. Econ. Ent., Jour. 58: 284-286, 1 table (induction of emergence). — Bacon, Barton, MacSwain, Marble and Stanger, 1965. Calif. Univ. Agr. Ext. Serv., AXT 160: 1-13 (management for alfalfa pollination). — Hobbs, 1965. Canada Dept. Agr., Pub. 1209: 1-11, 5 figs. (importation and management for alfalfa pollination). — Stephen and Osgood, 1965. Econ. Ent. Jour. 58: 965-968 (effect of tunnel size on sex ratio). — Johansen and Eves, 1966. Wash. State Univ. Agr. Expt. Sta., Circ. 469: 1-12 (parasites and nest destroyers). — Hobbs, 1967. Canada Dept. Agr., Pub. 1313: 1-19 (domestication). — Krombein, 1967. Trap-nesting wasps and bees, pp. 327-329 (life history, nest architecture). — Bohart and Knowlton, 1967. Utah. Ext. Serv., EL 104 (rev.): 1-7, 1 pl. (management for higher alfalfa seed yields). — Medler and Lussenhop, 1968. Wis. Univ. Res. Bul. 274: 29-30 (life history, parasites). — Waters, 1968. Idaho Agr. Expt. Sta., Current Information Series 97: 1-4 (beetle excluder trap). — Williams, 1968. Idaho Coll. Forestry, Wildlife and Range Sci., Station Note 10: 1-4 (nesting boards). — Hobbs, 1968. Canad. Ent. 100: 781-784 (control of insect enemies). — Johansen and Eves, 1969. Wash. Agr. Ext. Series, EM 2631 (rev.): 1-10 (control of natural enemies). — Klostermeyer and Gerber, 1969. Ent. Soc. Amer., Ann. 62: 1321-1325 (nesting behavior monitored by an event recorder). — Eves, 1970. Melanderia 4: 1-18, 7 figs., 11 tables (parasite). — Torchio, 1970. Ark. Agr. Ext. Serv., Mis. Publ. 127: 84-90 (parasite). — Johansen and Eves, 1971. Wash. Agr. Ext. Serv., EM 2631 (rev.): 1-10 (control of natural enemies). — Waters, 1971. Idaho Univ. Agr. Expt. Sta., Current Information Ser. 163: 1-4 (insect enemies and their control). — Hobbs and Kronic, 1971. Canad. Ent. 103: 674-685 (parasites). — Holm and Skou, 1972. Ent. Scand. 3: 169-180, 6 figs., 8 tables (life history, nest architecture, sex ratio). — Torchio, 1972. Melanderia 10: 1-22, 55 figs., 1 table (*Sapyga pumila* Cress., a parasite). — Torchio,

1972. *Melandria* 10: 23-30, 7 figs. (control of *Sapyga pumila* Cress.). —Telford, Johansen and Eves, 1972. Mededel. Fakult. Landbouwwetensch. Gent 37: 776-783 (management practices and insecticide poisoning). —Szabo and Smith, 1972. *Apiculture Res.*, Jour. 11: 157-165 (influence of light and temperature on adult activity). —Hobbs, 1972. *Bee World* 53: 167-173 (beekeeping with alfalfa leafcutter bees in Canada). —Thorpe and Briggs, 1972. *Environ. Ent.* 1: 399-401 (mortality of immatures in relation to alfalfa saponins). —Klostermeyer, Mech and Rasmussen, 1973. *Kans. Ent. Soc., Jour.* 46: 536-548 (sex and weight of progeny with provision weights). —Santis, 1973. *Cienc. e Abejas* 2: 15-19 (parasites). —Hobbs, 1973. *Canada Dept. Agr., Publ.* 1495: 1-30 (use in alfalfa pollination). —Torchio, 1974. *Utah State Univ. Agr. Expt. Sta., UMC* 48, *Res. Rept.* 16: 1-13, 18 figs. (biology and control of *Sapyga pumila* Cress., a parasite). —Parker and Pedersen, 1975. *Environ. Ent.* 4: 103-104 (effect of alfalfa saponins on larval mortality). —Tasei, 1975. *Apidologie* 6: 1-57 (adaptation of *N. Amer.* population introduced into France). —Davis, Johansen, and Eves, 1975. *Apiculture Research, Jour.* 14: 101-104, table (synthetic attractants). —Stephen and Undurraga, 1976. *Jour. Apicult. Res.* 15: 81-87, 4 figs. (x-radiography, an analytical tool in population studies). —Hobbs and Richards, 1976. *Canad. Ent.* 108: 165-167 (selection for univoltine strain). —Batra, 1976. *Kans. Ent. Soc., Jour.* 49: 18-22, tables 1-2 (comparative efficiency in alfalfa pollination).
- Morphology:** Gerber and Akre, 1969. *Melandria* 1: 1-36 (external). —Wachmann, Richter and Schriker, 1973. *Ztschr. f. Morph. Tiere* 76: 109-128 (fine structure of compound eye).

### Genus MEGACHILE Subgenus DELOMEGACHILE Viereck

*Megachile* subg. *Delomegachile* Viereck, 1916. *Conn. State Geol. and Nat. Hist. Survey*, Bul. 22: 745.

Type-species: *Megachile frigida* Smith. Monotypic. (= *Megachile vidua* Smith).

**addenda** Cresson. Que., Ont. and N. H. to Fla., west to Mich., Kans., Tex., and Calif. Pollen: Apparently polylectic, visits flowers of *Amorpha canescens*, *Asclepias*, *Baptisia tinctoria*, *Coreopsis*, *Dianthera*, *Encelia californica*, *Gillenia*, *Hieracium*, *Hypericum*, *Oenothera*, *Opuntia vulgaris*, *Penstemon*, *Polycodium*, *Psoralea floribunda*, *Rosa*, *Rubus*, *Tephrosia virginiana*, *Vaccinium*.

*Megachile addenda* Cresson, 1878. *Amer. Ent. Soc., Trans.* 7: 124. ♀, ♂.

*Megachile manumuskini* Viereck, 1902. *Canad. Ent.* 34: 328. ♀, ♂.

**Biology:** Graenicher, 1905. *Wis. Nat. Hist. Soc.* 3: 160-162 (nest).

**frigida appalachensis** Mitchell. N. Y. to Ga. in the Appalachian Mts. Pollen: Unknown, but visits flowers of *Apocynum*, *Baptisia*, *Coreopsis*, *Galax*, *Koellia*, *Penstemon*, *Pycnanthemum*, *Rhododendron catawbiense*, *Vernonia glauca*.

*Megachile (Delomegachile) vidua* var. *appalachensis* Mitchell, 1935. *Amer. Ent. Soc., Trans.* 61: 205. ♀, ♂.

**frigida frigida** Smith. Alaska and Canada, south to Pa., Mich., and Nebr. and in the mts. to N. Mex., Ariz. and cent. Calif. Ecology: Nesting in decaying poplar and also in borings in wood. Parasite: *Coelioxys funeraria* Sm., *C. moesta* Cress., *C. porterae* Ckll., *C. sodalis* Ckll. Pollen: Unknown, but visits flowers of *Apocynum*, *Astragalus*, *Campanula*, *Castilleja*, *Chamaenerion angustifolium*, *Epilobium*, *Iris*, *Malvastrum*, *Marrubium vulgare*, *Medicago sativa*, *Melilotus*, *Minulus*, *Monarda*, *Penstemon*, *Phacelia*, *Polemonium*, *Robinia*, *Rosa*, *Symphoricarpos*, *Trifolium*, *Verbena*, *Vicia*.

*Megachile frigida* Smith, 1853. *Cat. Hym. Brit. Mus.*, v. 1, p. 193. ♂.

*Megachile monardarum* Cockerell, 1900. *Ann. and Mag. Nat. Hist.* (7) 6: 11. ♀.

**Taxonomy:** Cockerell, 1905. *Amer. Ent. Soc., Trans.* 31: 338. —Cockerell, 1905. *Amer. Ent. Soc., Trans.* 31: 337. —Mitchell, 1962. *N. C. Agr. Expt. Sta. Tech. Bul.* 152: 133-134, figs. 43-45 (redescription).

**Biology:** Stephen, 1956. *Pan-Pacific Ent.* 32: 95-98 (life history). —Medler and Lussenhop, 1968. *Wis. Univ. Res. Bul.* 274: 21-22 (life history, parasite).

**gemula cressonii** Dalla Torre. Wash., Nev., Ariz.

*Megachile carbonaria* Cresson, 1879. *Amer. Ent. Soc., Trans.* 7: 208. ♀. Preocc.

*Megachile cressonii* Dalla Torre, 1896. *Cat. Hym.*, v. 10, p. 427. N. name.

*Megachile vandykei* Cockerell, 1925. *Calif. Acad. Sci., Proc.* (4) 14: 205. ♀.

- gemula gemula** Cresson. MacKenzie to N. S., south to Ga., west to Ill., Nebr., N. Mex., and Calif. north to B. C. and N. W. T., principally montane in south. part of range. Pollen: Unknown, but visits flowers of *Apocynum androsaemifolium*, *Asclepias speciosa*, *Baptisia tinctoria*, *Campanula rotundifolia*, *Chrysanthemum leucanthemum*, *Clematis*, *Coreopsis*, *Geranium maculata*, *Gerardia*, *Hydrangea*, *Philadelphus*, *Pycnanthemum*, *Rhododendron catawbiense*, *Rubus*, *Rudbeckia*, *Solidago lanceolata*, *Trifolium*, *Vaccinium*, *Vicia*.
- Megachile gemula* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 118. ♂ (♀ misdet.).
- Megachile avaria* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 123. ♂.
- Megachile Vancouveriensis* Provancher, 1888. Addit. Corr. Faune Ent. Canada, Hym., p. 424. ♂.
- Megachile albula* Lovell and Cockerell, 1907. Psyche 14: 18. ♂.
- Megachile* (*Delomegachile*) *gemula* var. *fulvogemula* Mitchell, 1936. Amer. Ent. Soc., Trans. 61: 185. ♀.
- Taxonomy: Titus, 1906. Ent. Soc. Wash., Proc. 7: 151 (synonymy).
- Biology: Fye, 1965. Canad. Ent. 97: 876-877, fig. 6, tables 2-4 (nest). — Medler and Lussenhop, 1968. Wis. Univ. Res. Bul. 274: 22 (nest).
- giliae** Cockerell. Alaska, N. W. T., B. C., Alta., Colo. Pollen: Unknown, but visits flowers of *Gilia*.
- Megachile giliae* Cockerell, 1906. Amer. Mus. Nat. Hist., Bul. 22: 452. ♂.
- ingenua** Cresson. Pa. to Fla., west to Ill. Pollen: Possibly oligolectic on *Tephrosia* including *T. virginiana*, but also visits flowers of *Lupinus* and *Vaccinium* presumably for nectar.
- Megachile ingenua* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 122. ♂.
- Megachile tephrosiana* Mitchell, 1927. Psyche 34: 179. ♀.
- melanophaea calogaster** Cockerell. B. C. and Idaho to mts. of cent. Calif. Pollen: Apparently polylectic, visits flowers of *Astragalus*, *Hackelia jessicae*, *Haplopappus aparagoides*, *Horkelia fusca*, *Lotus oblongifolius*, *Lupinus lyallii* *lyallii*, *L. superbus*, *Mimulus moschatus*, *M. tillingii*, *Pedicularis frigida*, *P. groenlandica*, *Phyllodoce breweri*, *Polemonium occidentale*, *Streptanthus tortuosus*.
- Megachile calogaster* Cockerell, 1898. Acad. Nat. Sci. Phila., Proc. 50: 55. ♂, ♀.
- melanophaea melanophaea** Smith. MacKenzie to Newfoundland, south to Calif., Ariz., Colo., Penn. and Ga.? Parasite: *Coelioxys rufitarsis* Sm., *C. sodalis* Cress. Pollen: Apparently polylectic, visits a wide variety of flowers including *Agostache occidentalis*, *Apocynum*, *Astragalus bisulcatus*, *Azalea*, *Campanula rotundifolia*, *Chamaenerion angustifolium*, *Cypripedium reginae*, *Epibolium angustifolium*, *Helianthus*, *Hemilobus tenellus*, *Lupinus argenteus*, *L. rootkatensis*, *Medicago sativa*, *Mimulus*, *Nolina*, *Phacelia*, *Psoralea argophylla*, *Ranunculus*, *Raphanus*, *Rhodora*, *Robinia*, *Rosa*, *Rubus*, *Rudbeckia*, *Solidago*, *Symphoricarpos occidentalis*, *Sisymbrium*, *Taraxacum*, *Vicia eracea*.
- Megachile melanophaea* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 191. ♀, ♂.
- Megachile canadensis* Friese, 1903. Ztschr. System. Hym. Dipt. 3: 248.
- Taxonomy: Cockerell, 1905. Amer. Ent. Soc., Trans. 31: 336 (synonymy).
- Biology: Graenicher, 1905. Wis. Nat. Hist. Soc., Bul. 3: 162-163 (life history, parasite).
- melanophaea rohweri** Cockerell. Colo., Utah, Ariz., N. Mex. Ecology: Uses pieces of *Symphoricarpos* leaves for nesting material. Pollen: Presumably polylectic, visits flowers of *Cirsium*, *Erysimum*, *Lupinus*, *Nolina*, *Robinia*, *Sisymbrium*, *Trifolium*.
- Megachile wootoni rohweri* Cockerell, 1906. Amer. Mus. Nat. Hist., Bul. 22: 453. ♀.
- Megachile pseudolatimanus* Strand, 1917. Arch. f. Naturgesch. 83 (abt. A, h. 11): 65. ♂.
- Megachile tuala* Strand, 1917. Arch. f. Naturgesch. 83 (abt. A, h. 11): 66. ♀.
- melanophaea submelanophaea** Mitchell. South. Calif., mts., Maine, Mich. Pollen: Presumably polylectic, visits flowers of *Dicentra chrysantha*, *Lupinus*.
- Megachile* (*Delomegachile*) *melanophaea* var. *submelanophaea* Mitchell, 1935. Amer. Ent. Soc., Trans. 61: 197. ♀.



- melanophaea wootoni** Cockerell, Mont., Nebr., Colo., N. Mex. Parasite: *Coelioxys sodalis* Cress., *C. rufitarsis* Sm. Pollen: Presumably polylectic, visits flowers of *Astragalus*, *Medicago sativa*.  
*Megachile wootoni* Cockerell, 1898. Ann. and Mag. Nat. Hist. (7) 1: 125. ♂.  
**mucida** Cresson. N. J., N. C., Ga., Tex. Pollen: Unknown, but visits flowers of *Lupinus*, *Polycodium*, *Rubus*, *Tephrosia virginiana*.  
*Megachile mucida* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 118. ♂ (♀ misdet).  
*Megachile mucida semimucida* Cockerell, 1909. Ann. and Mag. Nat. Hist. (8) 4: 26. ♀, ♂.  
*Megachile audar* Mitchell, 1924. Elisha Mitchell Sci. Soc., Jour. 40: 161. ♂.

#### Genus MEGACHILE Subgenus PHAENOSARUS Mitchell

- Megachile* subg. *Phaenosarus* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 303, 309.  
 Type-species: *Megachile fortis* Cresson. Orig. desig.  
**agustini** Cockerell. Colo., N. Mex., Utah, Ariz. Pollen: Unknown, but visits flowers of *Baileya*, *Helianthus*, *Heterotheca*, *Verbesina*, *Viguiera*, *Zexmenia*.  
*Megachile agustini* Cockerell, 1905. Ent. News 16: 82. ♂.  
*Megachile (Phaenosarus) subfortis* Mitchell, 1936. Amer. Ent. Soc., Trans. 62: 145. ♂.  
**fortis** Cresson. Ill., Iowa, Wis., S. Dak., Nebr., Kans., La., Tex., Colo., N. Mex., Ariz. Parasite: *Coelioxys rufitarsis* Sm. Pollen: Unknown, but visits flowers of *Dicorythum marginatum*, *Helianthus scaberrimus*, *H. subrhomboides*, *Silphium integrifolium*, *Solidago canadensis*, *Vernonia fasciculata*.  
*Megachile fortis* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 262. ♂.  
*Megachile emoryi* Cockerell, 1904. Entomologist 37: 7. ♀.  
*Megachile fortis* var. *vestali* Cockerell, 1913. Ann. and Mag. Nat. Hist. (8) 11: 530. ♂.  
 Biology: Hicks, 1926. Colo. Univ. Studies 15: 229 (nest, parasite).  
 Morphology: Fischer, 1957 (1956). Canad. Ent. 88: 657-673, 9 figs. (musculature of male metasoma and genitalia).

#### Genus MEGACHILE Subgenus MEGACHILOIDES Mitchell

- Megachiloides* Mitchell, 1924. Elisha Mitchell Sci. Soc., Jour. 40: 154.  
 Type-species: *Megachiloides oenotherae* Mitchell. Monotypic.  
 The bees of this subgenus appear to be specialists of the Onagraceae, collecting pollen especially from the large flowered species of the genus *Oenothera*. Apparently the species also differ in that some excavate their own nesting burrows while at least one species appropriates preexisting tunnels of other bees.  
 Taxonomy: Bohart and Youssef, 1972. Royal Ent. Soc. London, Trans. 124: 18 (biol. characters).  
**amica** Cresson. Kans., Tex. Pollen: Unknown, but visits flowers of *Anogra pallida*, *Monarda punctata*, *Opuntia*, *Verbesina encelioides*.  
*Megachile amica* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 265. ♂.  
**oenotherae** (Mitchell). N. J., N. C., Okla., Tex. Ecology: Nests in preexisting burrows of *Andrena macra* Mitchell in sandy loam soil, using cut leaves for cells and caps them with cut pieces of petals from *Oenothera laciniata*. Parasite: *Coelioxys piercei* Cwfd.?. Pollen: Collects pollen from the flowers of *Oenothera laciniata*, but also visits flowers of *Ceanothus americanus*, *Merioler drummondiana*, *Penstemon*.  
*Megachiloides oenotherae* Mitchell, 1924. Elisha Mitchell Sci. Soc., Jour. 40: 154. ♀, ♂.  
 Biology: Sivik, 1954. Ent. News 65: 256 (nest, parasite).  
**umatillensis** (Mitchell). Wash., Utah, Colo. Ecology: Excavates nesting burrows in partially stabilized sand dunes, uses *Oenothera* petals for cell walls and folds cell walls over at top to cap the cell. Parasite: *Coelioxys mesae* Kell., *Nemognatha lutea* LeC. Pollen: Collects pollen from flowers of *Oenothera pallida*.  
*Megachiloides umatillensis* Mitchell, 1927. Psyche 34: 118. ♂, ♀.  
 Biology: Bohart and Youssef, 1972. Royal Ent. Soc. London, Trans. 124: 1-19, 23 figs. (life history, foraging behavior, nest architecture, parasites).

## Genus MEGACHILE Subgenus DEROTROPIS Mitchell

*Megachile* subg. *Derotropis* Mitchell, 1936. Amer. Ent. Soc., Trans. 62: 119, 156.

Type-species: *Megachile pascoensis* Mitchell. Orig. desig.

Taxonomy: Mitchell, 1944. Pan-Pacific Ent. 20: 142-144 (Key to spp.).

**alamosana** Mitchell, 1944. Wyo., Colo.

*Megachile* (*Xeromegachile*) *alamosana* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 329. ♂.

**anograe** Cockerell. Mont., Wyo., Nebr., Colo., Kans., Tex., Oreg., Calif. Ecology: Excavates nesting burrows in sandy soil. Pollen: Collects pollen from flowers of *Opuntia* and *Oenothera albicaulis*, but visits other flowers presumably for nectar including *Anogra coronopifolia*, *Astragalus*.

*Megachile anograe* Cockerell, 1908. Ann. and Mag. Nat. Hist. (8) 1: 261. ♀.

**astragali** Mitchell. Calif. (Mojave Desert). Pollen: Unknown, but visits flowers of *Astragalus lentiginosus* var. *fremontii*.

*Megachile* (*Derotropis*) *astragali* Mitchell, 1938. Pan-Pacific Ent. 14: 174. ♂, ♀.

**gravita** Mitchell. Wash., Oreg., Calif. Pollen: Collects pollen from flowers of *Clarkia* including *C. amoena amoena*, *C. amoena huntiana*, *C. cylindrica*, *C. dudleyana*, *C. gracilis albicaulis*, *C. purpurea quadrivulnera*, *C. rubicunda*, *C. speciosa nitens*, *C. speciosa polyantha*, *C. speciosa speciosa*, *C. unguiculata*, *C. viminea*, *C. williamsonii*, but visits other flowers for nectar including *Chaenactis glabriuscula*, *Malacothamnus densiflorus*.

*Megachile* (*Xeromegachile*) *gravita* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 322. ♂.

*Megachile* (*Xeromegachile*) *astata* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 345. ♀.

Biology: MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 70: 20-23 (floral relationships).

**laurita** Mitchell. Wash., Oreg., Utah. Pollen: Collects pollen from flowers of *Oenothera pallida*, *O. trichocalyx*.

*Megachile laurita* Mitchell, 1927. Psyche 34: 115. ♀.

Biology: Linsley, MacSwain and Raven, 1963. Calif. Univ. Pubs. Ent. 33: 41 (floral relationships).

**melanderi** Mitchell. Tex., Calif. (Inyo Co.).

*Megachile* (*Derotropis*) *melanderi* Mitchell, 1944. Pan-Pacific Ent. 20: 140. ♀.

**pascoensis** Mitchell. Mont., Idaho, Wash., Oreg., Calif. Parasite: Lines cells with pieces of petals cut from flowers of *Clarkia cylindrica* and *C. speciosa*. Pollen: Oligolege of *Clarkia* including *C. amoena*, *C. biloba*, *C. bottae*, *C. cylindrica*, *C. dudleyana*, *C. elegans*, *C. gracilis albicaulis*, *C. pulchella*, *C. purpurea*, *C. rhomboidea*, *C. rubicunda*, *C. speciosa*, *C. unguiculata*, *C. xantiana*, but also visits other flowers for nectar including *Chamaebatia foliolosa*, *Convolvulus villosus*, *Cordylanthus pilosus*, *Sidalcea malvaeflora*, *Trifolium*, *Wyethia angustifolia*.

*Megachile* (*Xeromegachile*) *bakeri* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 316. ♂.

Preocc.

*Megachile* (*Xeromegachile*) *pascoensis* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 320. ♂.

*Megachile* (*Xeromegachile*) *gabrielensis* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 346. ♀.

Biology: MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 70: 23-26 (floral relationships).

**semilaurita** Mitchell. Utah.

*Megachile laurita semilaurita* Mitchell, 1927. Psyche 34: 116. ♀.

**subanograe** Mitchell. Tex., Wyo., Utah, Nev., east. Calif. Pollen: Unknown, but visits flowers of *Sphaeralcea ambigua*.

*Megachile* (*Megachiloides*) *subanograe* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 344. ♀.

**sublaurita** Mitchell. Utah.

*Megachile laurita sublaurita* Mitchell, 1927. Psyche 34: 117. ♀.

**xerophila** Cockerell. South. Calif., deserts., Ariz. Pollen: Unknown, but visits flowers of *Baileya*, *Chaenactis stevioides*, *Encelia*, *Geraea canescens*, *Helianthus niveus*, *Larrea*

*tridentata*, *Melilotus*, *Oenothera deltoidea*, *Palafoxia linearis*, *Sphaeralcea ambigua*, *S. emoryi*, *S. rosacea*.

*Megachile xerophila* Cockerell, 1933. Pan-Pacific Ent. 9: 27. ♀.

*yumensis* Mitchell. Ariz. (Wickenburg).

*Megachile (Derotropis) yumensis* Mitchell, 1944. Pan-Pacific Ent. 20: 141. ♀.

### Genus MEGACHILE Subgenus XEROMEGACHILE Mitchell

*Megachile* subg. *Xeromegachile* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 302, 309.

Type-species: *Megachile integra* Cresson. Orig. design.

**alata** Mitchell. South. and east. Calif., Ariz.; Mexico (Baja California). Pollen: Unknown, but visits principally flowers of the Compositae including *Bebbia juncea*, *Chrysothamnus*, *Encelia californica*, *E. farinosa*, *Eschscholzia*, *Helianthus gracilentus*, *Prosopis*, *Viguiera parishi*.

*Megachile (Xeromegachile) alata* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 324. ♂.

*Megachile (Xeromegachile) redlandica* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 331. ♀.

**boharti** Mitchell. South. Calif., Ariz.; Mexico (Sonora). Pollen: Unknown, but visits flowers of *Cercidium*, *Prosopis*.

*Megachile (Xeromegachile) boharti* Mitchell, 1942. Pan-Pacific Ent. 18: 74. ♀.

**bradleyi** Mitchell. Utah, Nev., Calif. (Antioch).

*Megachile (Xeromegachile) bradleyi* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 340. ♀.

**brimleyi** Mitchell. N. C., Fla. Pollen: Unknown, visits principally flowers of *Galactia*, but has also been found at flowers of *Erigeron volubilis*.

*Megachile brimleyi* Mitchell, 1926. Amer. Ent. Soc., Trans. 52: 114. ♂.

**bruneri** Mitchell. Colo., east. Calif.; Mexico (Baja California). Pollen: Unknown, but visits flowers of *Chrysothamnus*.

*Megachile (Xeromegachile) bruneri* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 328. ♂.

**casadae** Cockerell. S. Dak., Nebr., Okla., Tex., Wyo., Colo., N. Mex., Utah, Calif., Ariz. Pollen: Unknown, but visits flowers of *Helianthus*, *Opuntia*, *Populus*.

*Megachile casadae* Cockerell, 1898. Ann. and Mag. Nat. Hist. (7) 1: 127. ♂.

*Megachile populi* Cockerell, 1900. Ann. and Mag. Nat. Hist. (7) 6: 17. ♀.

*Megachile opuntiarum* Cockerell, 1906. Ann. and Mag. Nat. Hist. (7) 17: 229. ♀.

*Megachile austiniensis* Mitchell, 1927. Psyche 34: 105. ♀.

**coloradensis** Mitchell. Colo.

*Megachile (Xeromegachile) coloradensis* Mitchell, 1936. Amer. Ent. Soc., Trans. 62: 379. ♀.

**dakotensis** Mitchell. Minn., Iowa, Ill., Mont., N. Dak., S. Dak., Nebr., Tex. Pollen: Unknown, but visits flowers of *Amorpha canescens*, *Cleome serrulata*, *Helianthus*, *Kuhnistera candida*, *K. oligophylla*, *Petalostemon violaceus*, *Verbena*.

*Megachile dakotensis* Mitchell, 1926. Psyche 33: 164. ♂, ♀.

**deflexa** Cresson. N. C., Fla., Nebr., Kans., Okla., Tex. Pollen: Unknown, but visits flowers of *Bidens*, *Clethra*, *Coreopsis*, *Erigeron*, *Gaillardia amblydon*, *Geobanus pallidus*, *Petalostemon*, *Phaseolus*, *Rubus*, *Strophostyles*.

*Megachile deflexa* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 125. ♂.

*Megachile megagyna* Cockerell, 1909. Canad. Ent. 41: 394. ♀.

*Megachile indianorum* Cockerell, 1913. Ann. and Mag. Nat. Hist. (8) 11: 533. ♂.

*Megachile (Xeromegachile) coreopsana* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 319. ♂.

**dulciana** Mitchell. South. Calif.

*Megachile (Xeromegachile) dulciana* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 343. ♀.

**fucata** Mitchell. Colo., N. Mex., Utah, Ariz., Calif., deserts. Pollen: Possibly polylectic, is known to collect pollen from *Larrea tridentata*, but visits other flowers including *Argemone platyceros*, *Aster abatus*, *A. tortifolius*, *Baileya*, *Cercidium*, *Encelia frutescens*, *Palafoxia linearis*, *Prosopis*, *Senecio douglasii* var. *longilobus*.

*Megachile (Xeromegachile) fucata* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 323. ♂.

*Megachile (Xeromegachile) histrata* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 334. ♀.

Biology: Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 38 (floral relationships).

**hilata** Mitchell. Colo., Utah, east. Calif.

*Megachile (Xeromegachile) hilata* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 332. ♀.

**hookeri** Cockerell. Colo., Utah.

*Megachile hookeri* Cockerell, 1915. Ann. and Mag. Nat. Hist. (8) 15: 533. ♀.

**impartita** Mitchell. Colo., east. Calif.

*Megachile (Xeromegachile) impartita* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 333. ♀.

**instita** Mitchell. N. Mex., Calif., Ariz.; north. Mexico. Pollen: Possibly an oligolege of the Leguminosae, visits flowers of *Acacia*, *Cercidium*, *Cirsium*, *Prosopis*.

*Megachile (Xeromegachile) instita* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 326. ♂.

**integra** Cresson. N. J. to Fla., west to Ill., Kans., and Tex. Pollen: Unknown, but visits flowers of *Erigeron*, *Galactia*, *Glycina*, *Koellia*, *Phaseolus*, *Pycnanthemum*, *Strophostyles umbellata*.

*Megachile integra* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 121. ♂.

*Megachile strophostylis* Robertson, 1904. Canad. Ent. 36: 277. ♀.

**integrella** Mitchell. N. C., Fla. Pollen: Unknown, but visits flowers of *Hypericum*, *Oxydendrum*.

*Megachile integrella* Mitchell, 1926. Amer. Ent. Soc., Trans. 52: 116. ♀.

**inyoensis** Mitchell. Calif., Ariz. Pollen: Unknown, but visits flowers of *Encelia*.

*Megachile (Xeromegachile) inyoensis* Mitchell, 1942. Pan-Pacific Ent. 18: 117. ♀.

**laguniana** Mitchell. South. Calif.

*Megachile (Xeromegachile) laguniana* Mitchell, 1937. Amer. Ent. Soc., Trans. 63: 419. ♀.

**latita** Mitchell. Wyo., Colo.

*Megachile (Xeromegachile) latita* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 335. ♀.

**legalis** Cresson. Colo., Nev., Ariz., Wash., Oreg., east. Calif. Pollen: Unknown, but visits flowers of *Cirsium*, *Encelia farinosa*, *Iris*, *Senecio*.

*Megachile legalis* Cresson, 1879. Amer. Ent. Soc., Trans. 7: 209. ♂.

*Megachile (Xeromegachile) couleeana* Mitchell, 1938. Pan-Pacific Ent. 14: 171. ♀.

**macneilli** Mitchell. Calif. (Riverside Co.).

*Megachile (Xeromegachile) macneilli* Mitchell, 1957. Pan-Pacific Ent. 33: 24. ♂.

**manifesta** Cresson. Alta., Mont., N. Dak. to N. Mex., Ariz., south. Calif. Pollen: Unknown, but visits flowers of *Aster*, *Chrysothamnus nauseosus speciosus*, *Cleome*, *Grindelia squarrosa*, *G. sarothrae*, *Haplopappus*, *Helianthus*, *Viguiera*.

*Megachile manifesta* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 122. ♂.

*Megachile chrysothamni* Cockerell, 1908. Ann. and Mag. Nat. Hist. (8) 1: 262. ♀.

**maurata** Mitchell. Wyo., east. Calif., Ariz. Pollen: Unknown, but visits flowers of *Encelia*, *Sphaeralcea*. This is probably the male of *M. (Derotropis) subanograe* Mitchell.

*Megachile (Xeromegachile) maurata* Mitchell, 1936. Amer. Ent. Soc., Trans. 62: 369. ♂.

**micheneri** Mitchell. Colo., Calif. Pollen: Unknown, but visits flowers of *Viguiera multiflora*.

*Megachile (Xeromegachile) micheneri* Mitchell, 1936. Amer. Ent. Soc., Trans. 62: 373. ♂.

**mojavensis** Mitchell. South. and east. Calif., Ariz. Pollen: Unknown, but visits flowers of *Aster*, *Chaenactis*, *Encelia*, *Phacelia*.

*Megachile (Xeromegachile) mojaviensis* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 340. ♀.

**mucorosa** Cockerell. Nebr., Kans., Tex., Wyo., Colo., N. Mex., Utah, Ariz. Pollen: Unknown, but visits flowers of *Eustoma issenianum*, *Helianthus*, *Monarda*, *Ratibida columnaris*.

*Megachile mucorosa* Cockerell, 1908. Ann. and Mag. Nat. Hist. (8) 1: 265. ♂.

*Megachile (Argyropile) nebraskana* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 347. ♀.

**nelsoni** Mitchell. Colo.

*Megachile (Xeromegachile) nelsoni* Mitchell, 1936. Amer. Ent. Soc., Trans. 62: 381. ♀.

**nevadensis** Cresson. Mont. and Wyo. to N. Mex., west to Wash. and Calif., La. (Winnfield).

Pollen: Apparently an oligolege of autumnal flowering Compositae, including *Chrysopsis villosa*, *Chrysothamnus bernaerdina*, *C. nauseosus*, *C. n. consimilis*, *C. n. mohavensis*, *C. n. speciosus*, *C. pumilis*, *C. viridulus*, *C. viscidiflorus typicus*, *Grindelia camporum*, *Haplopappus acradenius*, *H. bloomeri* var. *angustatus*, *H. linearifolius*, *H. vernonioides*, *Helianthus*, *Heterotheca grandiflora*, *Pluchea camphorata*, *Senecio douglasii*, *Solidago*

*californica*, *S. confinis*, but also visits flowers of *Cleome* and *Melilotus* presumably for nectar.

*Megachile nevadensis* Cresson, 1879. Amer. Ent. Soc., Trans. 7: 209. ♀, ♂.

*oslari* Mitchell. Colo.

*Megachile (Xeromegachile) oslari* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 330. ♀.

*pagosiana* Mitchell. Colo.

*Megachile (Xeromegachile) pagosiana* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 333. ♀.

*palmensis* Mitchell. South. Calif., Ariz. Pollen: Unknown, but visits flowers of *Bebbia juncea*, *Cirsium*, *Echinocactus engelmannii*, *Echinocereus*, *Encelia farinosa*, *Sphaeralcea rosacea*, *Viguiera*.

*Megachile (Xeromegachile) palmensis* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 317. ♂.

*Megachile (Xeromegachile) smithi* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 337. ♀.

*parksii* Mitchell. Tex.

*Megachile (Xeromegachile) parksii* Mitchell, 1936. Amer. Ent. Soc., Trans. 62: 346. ♀.

*pseudolegalis* Mitchell. Calif. (Riverside Co.). Pollen: Unknown, but visits flowers of *Larrea tridentata*.

*Megachile (Xeromegachile) pseudolegalis* Mitchell, 1957. Pan-Pacific Ent. 33: 22. ♂.

*pseudonigra* Mitchell. Oreg., Calif., Ariz. Pollen: Unknown, but visits flowers of *Chaenactis glabriuscula*, *Cirsium*, *Oenothera campestris*.

*Megachile pseudonigra* Mitchell, 1927. Psyche 34: 112. ♀.

*rubi* Mitchell. N. C. to Fla. Ecology: Nests in sandy loam. Pollen: Unknown, but visits flowers of *Crataegus*, *Cuscuta*, *Ilex*, *Rubus*, *Senecio*.

*Megachile rubi* Mitchell, 1924. Elisha Mitchell Sci. Soc., Jour. 40: 159. ♀.

*Megachile neglecta* Mitchell, 1924. Elisha Mitchell Sci. Soc., Jour. 40: 160. ♂.

Biology: Sivik, 1954. Ent. News 65: 255-256 (nest).

*seducta* Mitchell. Calif. Pollen: Unknown, but visits flowers of *Lotus*.

*Megachile (Xeromegachile) seducta* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 342. ♀.

*soledadensis* Cockerell. Tex., N. Mex., Ariz., south. Calif. Parasite: *Coelioxys soledadensis* Ckll.

Pollen: Apparently an oligolege of Compositae, visits flowers of *Baccharis*, *Baileya multiradiata*, *Bebbia juncea*, *Chrysanthamnus*, *Encelia*, *Haplopappus*, *Heterotheca*, *Hymenothrix*, *Verbesina*, *Viguiera*.

*Megachile soledadensis* Cockerell, 1900. Ann. and Mag. Nat. Hist. (7) 6: 12. ♂, ♀.

*stoddardensis* Mitchell. Calif. (San Bernardino Co.), Ariz.

*Megachile (Xeromegachile) stoddardensis* Mitchell, 1957. Pan-Pacific Ent. 33: 25. ♂.

*subnigra angelica* Mitchell. Oreg., Calif., Ariz. Pollen: Unknown, although principally visits flowers of the Compositae, records include *Amsinckia intermedia*, *Achillea millefolium*, *Aster*, *Baccharis viminea*, *Balsamorhiza deltoidea*, *Bebbia juncea*, *Chaenactis artemisiaefolia*, *C. fremontii*, *C. glabriuscula*, *Coreopsis lanceolata*, *Cryptantha intermedia*, *Encelia actoni*, *E. californica*, *E. farinosa*, *Eriogonum fasciculatum*, *E. confertiflorum*, *Erysimum*, *Ferrocactus acanthodes*, *Haplopappus cooperi*, *H. linearifolius*, *H. pinifolius*, *Hesperochiron californicus*, *Isomeris arborea*, *Lupinus nanus*, *Oenothera campestris*, *Salvia*, *Sonchus oleraceus*, *Sweetia parryi*, *Viguiera laciniata*.

*Megachile (Xeromegachile) angelica* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 318. ♂.

*Megachile (Xeromegachile) blaisdelli* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 336. ♀.

*Megachile (Xeromegachile) moschata* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 338. ♀.

*subnigra subnigra* Cresson. Mont., Wyo., Colo., Utah, Idaho, Nev., B. C., Wash., Oreg., Calif., restricted to high mts. in south. part of range. Pollen: Unknown, but visits flowers of *Lupinus densiflorus*.

*Megachile subnigra* Cresson, 1879. Amer. Ent. Soc., Trans. 7: 208. ♀, ♂.

*toscata* Mitchell. Colo.

*Megachile (Xeromegachile) toscata* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 341. ♀.

*victoriana* Mitchell. Tex. (Victoria).

*Megachile (Xeromegachile) victoriana* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 315. ♂.

*wheeleri* Mitchell. Sask., N. Dak., Colo. to B. C. and mts. of Calif. and Ariz. Pollen: Unknown, but visits flowers of *Aster foliaceus*, *Chaenactis glabriuscula*, *Chenopodium*, *Chrysopsis*, *Chrysothamnus nauseosus speciosus*, *Cryptantha*, *Encelia*, *Grindelia maritima*, *G. squarrosa*, *Lasthenia*, *Layia glandulosa*, *Lygodesmia juncea*, *Medicago sativa*, *Solidago*, *Sphaeralcea ambigua*.

*Megachile wheeleri* Mitchell, 1927. *Psyche* 34: 107. ♀.

*Megachile spokaneensis* Mitchell, 1927. *Psyche* 34: 109. ♂.

*wyomingensis* Mitchell. Wyo.

*Megachile (Xeromegachile) wyomingensis* Mitchell, 1934. *Amer. Ent. Soc., Trans.* 59: 327.

♂.

### Genus MEGACHILE Subgenus ARGYROPILE Mitchell

*Megachile* subg. *Argyropile* Mitchell, 1934. *Amer. Ent. Soc., Trans.* 59: 302, 308.

Type-species: *Megachile parallela* Smith. Orig. desig.

Taxonomy: Mitchell, 1943. *Pan-Pacific Ent.* 19: 16 (Key to spp.).

*asterae* Mitchell. Utah. Pollen: Unknown, but visits flowers of *Aster*.

*Megachile (Argyropile) asterae* Mitchell, 1943. *Pan-Pacific Ent.* 19: 13. ♀.

*parallela* Smith. Transcont. U. S., south. Canada; Mexico. Ecology: Nests in ground, uses leaf-cuttings from *Spiraea* and *Trifolium*, but also accepts trap-nests for nesting. Pollen: Unknown, but visits a wide variety of flowers, notably of the family Compositae, including *Agoseris*, *Asclepias*, *Aster*, *Baccharis*, *Boltonia*, *Brassica geniculata*, *Calycadenia multiglandulosa*, *Ceanothus*, *Centaurea melitensis*, *C. solstitialis*, *Cephalanthus*, *Chrysanthemum*, *Chrysothamnus*, *Cirsium*, *Clarkia williamsonii*, *Coreopsis grandiflora*, *C. lanceolata*, *C. tinctoria*, *Corethrogyne*, *Encelia farinosa*, *Ericameria parishii*, *Erigeron pygmaeus*, *Eriophyllum confertiflorum*, *Gaillardia pulchella*, *Gilia*, *Gossypium*, *Grindelia camporum*, *Gutierrezia californica*, *G. sarothrae*, *Haplopappus squarrosus*, *H. vernonioides*, *Helenium bigelovii*, *Helianthus annuus*, *H. atrorubens*, *H. gracilentus*, *H. nuttallii*, *H. petiolaris*, *Heliopsis*, *Hemizonia lobbii*, *H. wrightii*, *Heterotheca grandiflora*, *H. subaxillaris*, *Hypericum*, *Lepachys*, *Lotus scoparius*, *Malacothrix tenuifolia*, *Medicago sativa*, *Melilotus alba*, *Palafoxia linearis*, *Phaseolus*, *Petalostemon*, *Ratibida*, *Rudbeckia*, *Senecio douglasii*, *silphium*, *Stephanomeria exigua*, *Verbena*, *Verbesina*, *Viguiera*, *Xanthocephalum*, *Zermeria*.

*Megachile parallela* Smith, 1853. *Cat. Hym. Brit. Mus.*, v. 1, p. 191. ♂.

*Megachile facunda* Cresson, 1872. *Amer. Ent. Soc., Trans.* 4: 266. ♂. N. syn.

*Megachile sexdentata* Robertson, 1895. *Amer. Ent. Soc., Trans.* 22: 125. ♂.

*Megachile verbesinae* Cockerell, 1908. *Ann. and Mag. Nat. Hist.* (8) 1: 264. ♀.

*Megachile (Argyropile) parallela* var. *rita* Mitchell, 1937. *Amer. Ent. Soc., Trans.* 63: 53. ♀.

Biology: Fischer, 1951. *Kans. Ent. Soc., Jour.* 24: 49-50 (nest). — Medler and Lussenhop, 1968. *Wis. Univ. Res. Bull.* 274: 26 (nest).

*rossi* Mitchell. Ariz. Pollen: Unknown, but visits flowers of *Aster*, *Bidens*, *Cercidium*, *Encelia*, *Verbesina*, *Viguiera*.

*Megachile (Argyropile) rossi* Mitchell, 1943. *Pan-Pacific Ent.* 19: 14. ♀.

*sabinensis* Mitchell. Ariz., Tex. Pollen: Unknown, but visits flowers of *Aster*, *Baileya*, *Eriogonum*, *Haplopappus*, *Helianthus*.

*Megachile (Argyropile) sabinensis* Mitchell, 1934. *Amer. Ent. Soc., Trans.* 59: 348. ♀.

*Megachile (Xeromegachile) pararubi* Mitchell, 1957. *Pan-Pacific Ent.* 33: 21. ♀.

*subparallela* Mitchell. Ariz. Ecology: Nests in ground under *Brayulinea densa*, uses entire leaves of *Desmodium* for cell construction. Pollen: Unknown, but visits flowers of *Eriogonum*, *Haplopappus*, *Heterotheca*.

*Megachile (Argyropile) subparallela* Mitchell, 1944. *Pan-Pacific Ent.* 20: 132. ♂.

*townsendiana* Cockerell. N. C. to Fla., west to Okla., Tex., Colo., N. Mex., Ariz., and southeast. Calif., Mexico. Ecology: Nests in sandy soil. Pollen: Unknown, but visits flowers of *Actinella*, *Baileya pleniradiata*, *Chrysopsis*, *Encelia frutescens*, *Geraea canescens*, *Helianthus debilis*, *Hoffmanseggia*, *Medicago sativa*, *Melanthra parviflora*, *Prosopis*, *Verbesina*, *Wislizenia refracta*.

*Megachile townsendiana* Cockerell, 1898. *Ann. and Mag. Nat. Hist.* (7) 1: 129. ♂.

- Megachile bishoppi* Cockerell, 1915. Ann. and Mag. Nat. Hist. (8) 15: 535. ♂.  
**tulariana** Mitchell. Calif. (Lemon Cove).  
*Megachile (Argyropile) parallela* var. *tulariana* Mitchell, 1937. Amer. Ent. Soc., Trans. 63: 53. ♀.

### Genus MEGACHILE Subgenus XANTHOSARUS Robertson

*Xanthosarus* Robertson, 1903. Amer. Ent. Soc., Trans. 29: 168.

Type-species: *Megachile latimanus* Say. Monotypic and orig. desig.

- cochisiana** Mitchell. N. Mex., Ariz., Nev., south. and east. Calif., Mexico. Ecology: Uses pieces cut from leaves of grape for nest construction. Pollen: Unknown, but visits flowers of *Cercidium*, *Lotus americanus*, *Medicago sativa*.

*Megachile (Xanthosarus) cochisiana* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 313. ♂.

*Megachile (Xanthosarus) pallidiana* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 314. ♀.

Taxonomy: Mitchell, 1942. Pan-Pacific Ent. 18: 116. ♀.

- comata** Cresson. Kans., Tex., Colo., N. Mex., Ariz., Calif.; Mexico. Pollen: Unknown, but visits flowers of *Asclepias*, *Gilia*, *Lotus*, *Marrubium vulgare*, *Phacelia*, *Senecio*.

*Megachile comata* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 262. ♂.

*Megachile armata* Smith, 1879. Descr. New Species Hym. Brit. Mus., p. 80. ♂.

*Megachile paratexana* Mitchell, 1930. Amer. Ent. Soc., Trans. 56: 226. ♀.

- dentitarsus** Sladen. Alta., Wash., Mont., N. Dak., S. Dak., Wyo., Nebr., Colo., Utah, N. Mex., Ariz. Ecology: Cuts pieces of grape leaves for nesting material. Pollen: Unknown, but visits flowers of *Aster*, *Cleome serrulata*, *Grindelia squarrosa*, *Gutierrezia sarothrae*, *Helianthus petiolaris*, *Medicago sativa*, *Melilotus*, *Solidago*, *Trifolium pratense*, *Verbena*.

*Megachile diligens* Sladen, 1918. Agr. Gaz. Canada 5: 125. ♂, ♀. Preocc.

*Megachile dentitarsus* Sladen, 1919. Canad. Ent. 51: 85. N. name.

Taxonomy: Sladen, 1918. Canad. Ent. 50: 303.

- innupta** Cockerell. Colo.

*Megachile innupta* Cockerell, 1915. Ann. and Mag. Nat. Hist. (8) 15: 534. ♀.

- latimanus** Say. Alta. to N. S., south to Ga., Kans., Wyo. and Colo. Parasite: *Coelioxys funeraria* Sm., *C. rufitarsis* Sm. Pollen: Polylectic, visits a wide variety of flowers including *Abutilon*, *Agastache*, *Althaea rosea*, *Amorpha*, *Apocynum androsaemifolium*, *Arabis*, *Asclepias*, *Aster*, *Astragalus*, *Baptisia*, *Bidens*, *Blephilia*, *Boltonia*, *Campanula petiolata*, *Carduus*, *Cassia*, *Cephalanthus*, *Chamaenerion*, *Chrysopsis*, *Cirsium*, *Cleome*, *Convolvulus*, *Coreopsis*, *Epilobium angustifolium*, *Eupatorium*, *Gaillardia*, *Gerardia*, *Grindelia*, *Helenium*, *Helianthus*, *Hieracium*, *Hydrophyllum*, *Kuhnistera*, *Lactuca*, *Lepachys*, *Lespedeza*, *Liatris*, *Malvastrum*, *Medicago sativa*, *Melilotus alba*, *Mentzelia*, *Monarda*, *Penstemon cyanthus*, *Petalostemon*, *Physostegia*, *Polemonium*, *Potentilla*, *Psoralea*, *Pycnanthemum*, *Rosa*, *Rudbeckia*, *Ruellia*, *Solidago*, *Sonchus*, *Stachys*, *Strophostyles*, *Taraxacum*, *Teucrium*, *Trautneria*, *Trifolium repens*, *Verbena*, *Verbesina*, *Vernonia*, *Vicia*.

*Megachile latimanus* Say, 1823. West. Quart. Rptr. 2: 81. ♂.

*Megachile femorata* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 188. ♂.

*Megachile acuta* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 192. ♀.

*Megachile vidua* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 192. ♀.

- Biology: Graenicher, 1905. Wis. Nat. Hist. Soc., Bul. 3: 162-163, figs. 4, 4a, 5 (life history, nest architecture, parasite). —Medler and Lussenhop, 1968. Wis. Univ. Res. Bul. 274: 24 (nest, parasite).

Morphology: Mitchell, 1932. Elisha Mitchell Sci. Soc., Jour. 47: 52-54, pl. 4 (gynandromorph).

- perihirta** Cockerell. Alta. to Nebr. and Tex., west to B. C. and Calif., Mich.?, Mexico. Parasite: *Coelioxys grindeliae* Ckll., *C. octodentata* Say, *C. rufitarsis* Sm., *Dasymutilla fulvohirta* (Cress.), *Nemognatha lutea* LeC., *Physocephala fronto* (Will.). Pollen: Polylectic, visits flowers of many families, especially those of the family Compositae; visitation records include *Arnica*, *Asclepias galioides*, *Aster adscendens*, *A. canescens*, *A. foliaceus*,

*Astragalus parishii*, *Bidens laevis*, *Castilleja miniata*, *Calendula*, *Centaurea solstitialis*, *Chrysopsis villosa*, *Chrysothamnus nauseosus*, *C. n. speciosus*, *C. viscidiflorus typicus*, *Cirsium andersonii*, *C. californicum*, *C. lanceolatum*, *C. tioganum*, *Clarkia viminea*, *Cleome serrulata*, *Coreopsis lanceolata*, *Cosmos bipinnatus*, *Dicentra chrysantha*, *Encelia farinosa*, *Epilobium angustifolium*, *Erigeron glaucus*, *Eriogonum fasciculatum*, *E. f. var. polifolium*, *E. latifolium var. nudum*, *Eschscholzia californica*, *Eupatorium occidentale*, *Gormania obtusata*, *Grindelia platyphylla*, *G. stricta var. procumbens*, *Gutierrezia sarothrae*, *Haplopappus apargioides*, *H. vernonioides*, *Helenium bigelovii*, *Helianthus annuus*, *H. petiolaris*, *Horkelia bernardina*, *Lathyrus odoratus*, *Lotus argophyllus*, *L. glaber*, *L. oblongifolius*, *Lotus scoparius*, *Lupinus paynei*, *Medicago sativa*, *Melilotus officinalis*, *Microseris nutans*, *Mimulus tillingii*, *Phacelia frigida*, *P. ramosissima*, *Pluchea camphorata*, *Potentilla*, *Robinia*, *Rosa californica*, *Senecio douglasii*, *S. integerrimus*, *Solidago californica*, *S. confinis*, *S. multiradiata*, *S. occidentalis*, *Spiraea densiflora*, *Stephanomeria virgata*, *Symphoricarpos*, *Taraxacum officinale*, *Trichostema lanceolatum*, *T. involucreatum*, *Verbena*, *Vicia*, *Wyethia*.

*Megachile perihirta* Cockerell, 1898. Ann. and Mag. Nat. Hist. (7) 1: 126. ♂.

*Megachile latimanus grindeliarum* Cockerell, 1904. Ent. News 15: 33. ♀.

Biology: Hicks, 1926. Colo. Univ. Studies 15: 233 (nest, parasite). — Hicks, 1936. Canad. Ent. 68: 49 (nest, parasite). — Hobbs, 1957 (1956). Canad. Ent. 88: 625-631 (life history, parasites).

### Genus MEGACHILE Subgenus LEPTORACHIS Mitchell

*Megachile* subg. *Leptorachis* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 301, 308.

Type-species: *Megachile petulans* Cresson. Orig. desig.

**petulans** Cresson. N. J. to Fla., west to N. Dak., Nebr., and Ariz., Mexico. Pollen: Polylectic, visits many flowers, especially Compositae, Labiatae, Leguminosae; visitation records include flowers of *Achillea*, *Apocynum*, *Asclepias*, *Aster*, *Baptisia*, *Bidens*, *Blephilia*, *Buddleia*, *Brauneria*, *Campanula rotundifolia*, *Cassia*, *Cephalanthus*, *Chamaecrista*, *Chrysanthemum leucanthemum*, *Cicuta*, *Cirsium*, *Coreopsis stellata*, *Crotalaria*, *Desmodium*, *Eryngium*, *Flaveria*, *Galactia*, *Gerardia*, *Grindelia*, *Helenium*, *Helianthus atrorubens*, *Houstonia purpurea*, *Hydrolea*, *Hypericum*, *Hyptis*, *Ilex*, *Koelia*, *Lespedeza repens*, *Liatris*, *Lobelia*, *Ludwigia*, *Lycopus*, *Lythrum*, *Melilotus alba*, *Nepeta*, *Pastinaca*, *Phaseolus*, *Polygonum*, *Psoralea*, *Pycnanthemum*, *Rhododendron*, *Rhus*, *Rubus*, *Rudbeckia*, *Senecio*, *Silphium*, *Solidago*, *Strophostyles*, *Tephrosia*, *Trifolium*, *Verbena*, *Verbesina*, *Vernonia glauca*, *Vicia*.

*Megachile petulans* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 127. ♂.

*Megachile mexicana* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 127. ♀, ♂.

### Genus MEGACHILE Subgenus PSEUDOCENTRON Mitchell

*Megachile* subg. *Pseudocentron* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 303, 307.

Type-species: *Megachile pruina* Smith. Orig. desig.

**bidentata** (Fabricius). Supposedly North American, but probably Neotropical.

*Andrena bidentata* Fabricius, 1775. Syst. Ent., p. 377. ♂.

**morio** Smith. "North America."

*Megachile morio* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 189. ♀. Probably a form of *pruina*.

**pruina nigropinguis** Mitchell. Tex.

*Megachile* (*Pseudocentron*) *pruina* var. *nigropinguis* Mitchell, 1937. Amer. Ent. Soc., Trans. 63: 68. ♀.

**pruina pruina** Smith. N. C., Ga., Fla., Bermuda. Pollen: Unknown, but visits flowers of *Asclepias tuberosa*, *Crotalaria*, *Croton linearis*, *Cuscuta*, *Dalbergia ecastophyllum*, *Gaillardia*, *Galactia floridana*, *Helianthus*, *Melanthera parviflora*, *Ocimum*, *Rhus*, *Strophostyles*, *Vernonia blodgettii*.

*Megachile pruina* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 190. ♀.

*Megachile pinguis* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 125. ♂.



- Megachile floridana* Robertson, 1895. Amer. Ent. Soc., Trans. 22: 125. ♂.  
*Megachile shermani* Mitchell, 1924. Elisha Mitchell Sci. Soc., Jour. 40: 163. ♂.  
*Megachile pruina* var. *bermudensis* Mitchell, 1929. Psyche 36: 93. ♀.

Taxonomy: Cockerell, 1905. Amer. Ent. Soc., Trans. 31: 337.

**sidalceae** Cockerell. Tex., N. Mex., Ariz., south. Calif., Mexico. Ecology: Uses pieces of leaves cut from *Amaranthus*, *Boerhaavia*, *Fraxinus*, alfalfa, chinaberry, cotton, cottonwood, rose, and umbrella tree for nesting material. Parasite: *Coelioxys novomexicana* Ckll. Pollen: Polylectic, visits a wide variety of flowers including *Acacia*, *Aloysia*, *Asclepias*, *Asparagus*, *Baccharis*, *Cephalanthus*, *Cercidium*, *Cleome*, *Condalia*, *Croton californicus*, *Encelia*, *Eriogonum*, *Ferocactus*, *Franseria*, *Funastrum*, *Gutierrezia*, *Haplopappus*, *Helianthus*, *Hoffmanseggia*, *Hymenothrix*, *Kallstroemia grandiflora*, *Larrea tridentata*, *Lepidium*, *Lotus*, *Medicago sativa*, *Melilotus*, *Mimosa*, *Mortonia*, *Olneya tesota*, *Opuntia*, *Pectis papposa*, *Prosopis glandulosa* var. *glandulosa*, *Psilostrophe cooperi*, *Salix*, *Salsola*, *Sapindus*, *Senecio douglasii*, *Sidalcea malvaeflora*, *Tamarix*, *Verbesina*, *Wislizenia*.

*Megachile sidalceae* Cockerell, 1897. Amer. Ent. Soc., Trans. 24: 158. ♂.

*Megachile abducta* Mitchell, 1926. Amer. Ent. Soc., Trans. 52: 111. ♂.

Biology: Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 38 (floral relationships with *Larrea*).

#### Genus MEGACHILE Subgenus ACENTRON Mitchell

*Megachile* subg. *Acentron* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 303, 307.

Type-species: *Megachile albitarsis* Cresson. Orig. desig.

**albitarsis** Cresson. Mich., Ind., N. C., Ga., Fla., Ala., Miss., La., Tex., N. Mex., Ariz.; Mexico. Pollen: Apparently polylectic, visits flowers of *Asclepias*, *Aster*, *Bidens*, *Cassia*, *Cephalanthus*, *Chrysopsis*, *Coreopsis*, *Cyrtilla*, *Eryngium*, *Flaveria*, *Gaillardia*, *Galactia*, *Helenium*, *Helianthus*, *Ilex*, *Ipomoea*, *Kallstroemia grandiflora*, *Lespedeza repens*, *Liatris*, *Melilotus*, *Phaseolus*, *Pycnanthemum hypsopifolia*, *Rhus*, *Rudbeckia*, *Solidago*, *Stokesia*, *Verbena*, *Xyris caroliniana*.

*Megachile albitarsis* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 263. ♂.

*Megachile optiva* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 268. ♀.

*Megachile newelli* Cockerell, 1908. Ann. and Mag. Nat. Hist. (8) 1: 262. ♀.

*Megachile kallstroemiae* Cockerell, 1908. Ann. and Mag. Nat. Hist. (8) 1: 264. ♀.

#### Genus MEGACHILE Subgenus MELANOSARUS Mitchell

*Megachile* subg. *Melanosarus* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 303, 307.

Type-species: *Megachile xylocopoides* Smith. Orig. desig.

**bahamensis** Mitchell. Fla.; Bahamas. Pollen: Unknown, but visits flowers of *Bidens leucantha*, *Flaveria*, *Melanthera brevifolia*, *Poinsettia cyathophora*.

*Megachile bahamensis* Mitchell, 1927. Psyche 34: 47. ♀.

*Megachile (Melanosarus) floridensis* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 349. ♂, ♀.

**xylocopoides** Smith. Md., N. C., Ga., Fla., Ala., Miss., La., Tex. Parasite: *Coelioxys dolichos* Fox, *Leucospis affinis* Say, *Melittobia* possibly *megachilis* (Pack.), *Tetrastichus megachilidis* Burks. Pollen: Polylectic, visits flowers of *Bidens leucantha*, *Borreria*, *Cephalanthus*, *Citrus limonum*, *Elephantopus carolinianus*, *Gaillardia*, *Helenium*, *Helianthus*, *Ilex*, *Itea*, *Mikania*, *Oxypholis*, *Phaseolus*, *Poinsettia cyathophora*, *Polygonum*, *Rhus*, *Rubus*, *Rudbeckia hirta*, *Senecio*, *Solidago*, *Trifolium*, *Vernonia*.  
*Megachile xylocopoides* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 189. ♀, ♂.

Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 329-331, pl. 20, fig. 98 (life history, nest architecture, supersedure, parasites).

#### Genus MEGACHILE Subgenus SAYAPIS Titus

*Gnathocera* Provancher, 1883. Nat. Canad. 13: 232. Preocc.

Type-species: *Megachile pugnatus* Say. Monotypic. (= *Gnathocera cephalica* Provancher).

*Ceratias* Robertson, 1903. Amer. Ent. Soc., Trans. 29: 168. Preocc.

Type-species: *Megachile pugnatus* Say. Orig. desig.

*Sayapis* Titus, 1905. Ent. Soc. Wash., Proc. 7: 154. Proposed to replace *Gnathocera* Provancher and *Ceratias* Robertson.

**dentipes** Vachal. South. Tex. to Paraguay.

*Megachile dentipes* Vachal, 1909. Rev. de Ent. 28: 12. ♂.

*Megachile poculifera* Cockerell, 1919. U. S. Natl. Mus., Proc. 55: 217. ♂.

**fidelis** Cresson. Mont. and S. Dak., Nebr., N. Mex., west to Idaho, Oreg., Calif. Pollen:

Polylectic, visits a wide variety of flowers, notably those of the family Compositae; visitation records include *Aster canescens*, *A. delectabilis*, *Calycadenia multiglandulosa*, *Ceanothus leucodermis*, *Chrysopsis fastigiata*, *C. villosa*, *Chrysothamnus nauseosus*, *C. viscidiflorus typicus*, *Cirsium*, *Cleome serrulata*, *Cleomella*, *Coreopsis lanceolata*, *Croton californicus*, *Cosmos*, *Daucus carota*, *Erigeron divergens*, *E. stenophyllus*, *Eriogonum fasciculatum* var. *polifolium*, *E. latifolium* var. *nudum*, *E. subscaposum*, *E. wrightii*, *Grindelia camporum*, *G. stricta* var. *procumbens*, *Gutierrezia californica*, *G. sarothrae*, *Haplopappus arborescens*, *H. bloomeri* var. *angustatus*, *Helenium bigelovii*, *H. puberulum*, *Helianthus gracilentus*, *H. petiolaris*, *Heliopsis*, *Heterotheca*, *Lotus scoparius*, *Lupinus*, *Marrubium vulgare*, *Mentha pulegium*, *Monarda*, *Phacelia*, *Rhamnus californica*, *Rudbeckia californica*, *Senecio douglasii*, *Solidago californica*, *S. confinis*, *Verbena*, *Viguiera*.

*Megachile fidelis* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 120. ♀, ♂.

*Megachile fidelis* var. *concinnula* Cockerell, 1899. Entomologist 32: 158. ♂.

**frugalis frugalis** Cresson. Pa. and N. J., to Fla., west to Calif.; Mexico. Pollen: Polylectic, visits flowers of *Croton*, *Erigeron*, *Eriogonum fasciculatum*, *Helianthus*, *Lotus*, *Marrubium vulgare*, *Opuntia*, *Perezia microcephala*, *Tephrosia virginiana*.

*Megachile frugalis* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 266. ♂.

**frugalis pseudofrugalis** Mitchell. Ariz., Calif. Pollen: Polylectic, visits a wide variety of flowers including *Acacia greggii*, *Asclepias erosa*, *Aster spinosus*, *Bebbia juncea*, *Cercidium*, *Chaenactis*, *Chilopsis linearis*, *Clarkia*, *Cirsium vulgare*, *Cissus*, *Cleome serrulata*, *Croton californicus*, *Cryptantha*, *Dalea emoryi*, *Encelia californica*, *E. farinosa*, *Eriodictyon crassifolium*, *Eriogonum elongatum*, *E. fasciculatum*, *E. f. var. polifolium*, *E. wrightii*, *Grindelia*, *Gutierrezia camporum*, *G. sarothrae*, *Haplopappus squarrosus*, *Helianthus gracilentus*, *Hemizonia fasciculata*, *Hyptis emoryi*, *Lotus hamatus*, *L. scoparius*, *Marrubium vulgare*, *Melilotus*, *Perezia microcephala*, *Penstemon*, *Petalonyx thurberi*, *Prosopis glandulosa* var. *torreyanum*, *P. pubescens*, *Salvia clelandii*, *Sapindus*, *Senecio douglasii*, *Tamarix gallica*, *Trichostema parishii*, *Verbesina encelioides*, *Wislizenia refracta*.

*Megachile (Sayapis) frugalis* var. *pseudofrugalis* Mitchell, 1937. Amer. Ent. Soc., Trans. 63: 186. ♂, ♀.

**helianthi** Cockerell. Colo. Pollen: Unknown, but visits flowers of *Helianthus lenticularis*.

*Megachile helianthi* Cockerell, 1908. Ann. and Mag. Nat. Hist. (8) 1: 259. ♀.

**inimica inimica** Cresson. Fla. to Tex., Ariz.; Mexico south to Guatemala. Ecology: Nests in holes in mesquite trees and mesquite fence posts, and uses leaves of *Monisia pallida* to line their nests; also nests in trap nests which were plugged with 5mm. of firmly agglutinated sand by this species. Parasite: *Melittobia chalybii* Ashm. Pollen: Polylectic, visits flowers of *Achyranthes*, *Avicennia*, *Bidens leucantha*, *Borrichia frutescens*, *Coccoloba*, *Crotalaria pumila*, *Helenium*, *Heliopsis*, *Heterotheca*, *Lacinaria punctata*, *Melilotus*, *Ocimum*, *Salvia ballotaeiflora*, *Sphaeralcea*, *Vitex negundo* var. *incisa*, *Ximenesia encelioides*.

*Megachile inimica* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 267. ♀.

Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 331-332 (life history, nest architecture, parasite).

**inimica jacumbensis** Mitchell. Calif.; Mexico (Baja California). Pollen: Apparently polylectic, visits flowers of *Chrysothamnus*, *Eriogonum fasciculatum*, *Haplopappus arborescens*, *Heterotheca grandiflora*, *Grindelia camporum*, *Senecio douglasii*, *Solidago*.

*Megachile inimica* var. *jacumbensis* Mitchell, 1927. Psyche 34: 109.

- inimica sayi** Cresson. Pa. to Fla., west to Idaho and Calif.; Mexico. Ecology: Nests in borings, and closing plug is 5mm. thick consisting of leaf cuttings, pebbles, and leaf pulp. Pollen: Polylectic, especially on flowers of the family Compositae (Heliantheae, Cynarieae, Eupatorieae), visits a wide variety of these and other flowers including *Arctium*, *Aster*, *Bidens*, *Blephilia*, *Brauneria*, *Cephalanthus*, *Chrysopsis mariana*, *Chrysothamnus nauseosus consimilis*, *Cleome*, *Coreopsis stellata*, *Gilia*, *Gutierrezia californica*, *Haplopappus*, *Helianthus*, *Helianthus petiolaris*, *Heliopsis helianthoides*, *Heterotheca*, *Kallstroemia grandiflora*, *Lepachys*, *Liatris*, *Lythrum*, *Marrubium vulgare*, *Melilotus alba*, *Penstemon*, *Petalostemon*, *Pycnanthemum*, *Rudbeckia*, *Senecio*, *Silphium*, *Solidago*, *Strophostyles*, *Teucrium*, *Verbena*, *Verbesina encelioides*, *Vernonia fasciculata*, *V. glauca*, *Vicia*, *Viguiera*, *Zexmenia*.
- Megachile sayi* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 119. ♂, ♀.
- Megachile heterodonta* Cockerell, 1900. Ann. and Mag. Hist. (7) 6: 18. ♀.
- Megachile sayi paludicola* Cockerell, 1911. U. S. Natl. Mus., Proc. 40: 254. ♀.
- Megachile sayi* var. *sancta* Cockerell, 1912. Ann. and Mag. Nat. Hist. (8) 10: 487. ♂.

Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 332-334 (life history, nest architecture, supersedure). — Medler and Lussenhop, 1968. Wis. Univ. Res. Bul. 274: 23-24 (life history, nest).

- mellitarsis** Cresson. B. C., Wash., Oreg., Calif., Nev., Colo., N. Mex., Ariz. Pollen: Apparently polylectic, visits flowers of *Aster*, *Chrysothamnus*, *Encelia*, *Eriogonum*, *Phacelia*, *Solidago multiradiata*.
- Megachile mellitarsis* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 121. ♂.
- Megachile terrestris* Cockerell, 1908. Ann. and Mag. Nat. Hist. (8) 1: 260. ♀. Preocc.
- Megachile geophila* Cockerell, 1908. Canad. Ent. 40: 460. N. name.
- newberryae** Cockerell. N. Mex., Ariz., Calif., Mexico, deserts. Ecology: Nests in holes in *Prosopis* and uses pieces of leaves cut from *Celtis* for cell construction. Pollen: Apparently polylectic, visits flowers of *Acacia greggii*, *Asclepias*, *Aster*, *Cercidium torreyanum*, *Encelia*, *Funastrum*, *Helianthus*, *Larrea tridentata*, *Melilotus alba*, *Olneya tesota*, *Opuntia*, *Pittosporum*, *Prosopis glandulosa* var. *torreyanum*, *P. juliflora*, *P. pubescens*, *Senecio douglasii*, *Verbesina encelioides*.
- Megachile newberryae* Cockerell, 1900. Entomologist 33: 244. ♂.
- Megachile howardi* Cockerell, 1919. U. S. Natl. Mus., Proc. 55: 216. ♂ (♀ misdet.).

Biology: Butler, 1965. Ariz. Agr. Exp. Sta. Tech. Bul. 187: 14 (nest).

- pollicaris** Say. Fla., La., Nebr., Kans., Okla., Tex., Colo., N. Mex., Ariz., Calif.; Mexico. Ecology: Uses leaflets from *Eysenhardtia polystachya*, *Mimosa biuncifera*, and *Prosopis* for plug construction; nests in trap nests, the larvae develop amicably in a single large brood cell with no apparent cannibalism. Parasite: *Coelioxys texana* Cress., *Leucospis affinis* Say, *Melittobia chalybii* Ashm. Pollen: Polylectic, especially flowers of the Compositae (Heliantheae), but in some localities uses pollen solely from *Prosopis* for nest provision; visitation records include *Acacia*, *Amorpha fruticosa*, *Asclepias*, *Baccharis*, *Bidens*, *Brauneria pallida*, *Chrysothamnus*, *Condalia*, *Coreopsis lanceolata*, *Croton californicus*, *Encelia californica*, *Erigeron*, *Eriogonum inflatum*, *Gutierrezia sarothrae*, *Haplopappus acradenius*, *Helianthus*, *Larrea tridentata*, *Melilotus*, *Oenothera*, *Opuntia*, *Palafoxia linearis*, *Petalostemon*, *Salsola*, *Salvia ballotaeflora*, *Senecio douglasii*, *Silphium*, *Solidago*, *Tamarix*, *Verbena*, *Verbesina encelioides*, *Viguiera multiflora*.
- Predator: *Pygmites ventricosus* (Newport).
- Megachile pollicaris* Say, 1831. Descr. New Spp. No. Amer. Ins. Found in La. by J. Barabino, p. 17. ♀.
- Megachile pollicaris* Say, 1837. Boston Jour. Nat. Hist. 1: 406. ♂. Emend.
- Megachile grandis* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 268. ♀. Preocc.
- Megachile pollicaris* var. *peregrina* Cockerell, 1900. Ann. and Mag. Nat. Hist. (7) 6: 12. ♂.
- Megachile vallorum* Cockerell, 1900. Ann. and Mag. Nat. Hist. (7) 6: 18. ♀.

Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 334-337, pl. 19, figs. 92-97 (life history, nest architecture, larval food, supersedure, parasite). — Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 38 (floral relationships).

**pugnata pomonae** Cockerell. Nev., Calif., Ariz. Pollen: Presumably polylectic, visits flowers of *Arctium*, *Chrysothamnus*, *Cirsium*, *Dicentra chrysanthia*, *Mimulus*, *Raillardella scaposa*, *Senecio*, *Solidago*, *Sphenosciadium capitellatum*, *Symphoricarpos*, *Taraxacum officinale*, *Viguiera multiflora*, *Wyethia mollis*.

*Megachile pugnata* var. *pomonae* Cockerell, 1916. Ann. and Mag. Nat. Hist. (8) 17: 278. ♀.

**pugnata pugnata** Say. U. S. and south. Canada except lower Mississippi Valley, Gulf Coast, and Calif., principally at moderate to high altitudes in southern part of range. Ecology: Nests in borings in sumac twigs. Parasite: *Coelioxys alternata* Say. Pollen: Polylectic, especially flowers of Compositae (Heliantheae; Cynarieae), visits flowers of *Achillea lanulosa*, *Arctium minus*, *Asclepias*, *Aster*, *Besseyia plantaginea*, *Blephilia*, *Brauneria pallida*, *Carduus plattinus*, *C. undulatus*, *Chrysanthemum leucanthemum*, *Cicuta*, *Cirsium californicum*, *Cleome*, *Coreopsis*, *Dianthera*, *Erigeron*, *Helianthus tuberosus*, *Lepachys*, *Marrubium vulgare*, *Melilotus*, *Nepeta*, *Phacelia*, *Rudbeckia hirta*, *R. occidentalis*, *Senecio*, *Silphium*, *Solidago*, *Taraxacum officinale*, *Trifolium repens*, *Verbena*, *Verbesina*, *Vernonia*.

*Megachile pugnatus* Say, 1837. Boston Jour. Nat. Hist. 1: 408. ♂, ♀.

*Megachile scobiculata* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 191. ♂.

*Megachile bucephala* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 193. ♀.

*Megachile disparilis* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 264. ♂.

*Megachile lucrosa* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 267. ♀.

*Gnathocera cephalica* Provancher, 1882. Nat. Canad. 13: 233. ♀.

*Megachile temporalis* Friese, 1903. Ztschr. System. Hym. Dipt. 3: 247. ♀ (♂ misdet.).

Taxonomy: Cockerell, 1905. Amer. Ent. Soc., Trans. 31: 337.

Biology: Medler, 1964. Canad. Ent. 96: 918-921, 1 fig. (life history, nest architecture, parasite). — Medler and Lussenhop, 1968. Wis. Univ. Res. Bul. 274: 27 (nest, parasites).

#### NOMINA NUDA IN MEGACHILE

*Megachile coloradensis* Uhler, 1877. U. S. Geol. Survey, Bul. 3: 784.

*Megachile consimilis* Evans, 1896. Canad. Ent. 28: 13.

### Genus CHALICODOMA Lepeletier

This genus, which is represented in North America by two subgenera, contains a number of subgenera in the Old World and one subgenus is present in South America. The bees of this genus do not use pieces of leaves or petals in the construction of their nests, but rather use resin, mud and other such materials.

Revision: Mitchell, 1937. Amer. Ent. Soc., Trans. 63: 381-426, pls. XXVI-XXIX (Part VIII, treats Nearctic spp. of the subgenus *Chelostomoides*; addenda and index to previous parts).

Taxonomy: Mitchell, 1956. Pan-Pacific Ent. 32: 129-138 (Key to Nearctic and Neotropical spp.). — Michener, 1962. N. Y. Ent. Soc., Jour. 70: 17-29 (classification). — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 181-190, figs. 59-62, table 6 (eastern U. S. spp.).

— Pasteels, 1965. Mus. Royal l' Afrique Centr., Ann. Sci. Zool. 137: ix and 579 pp. (classification). — Butler, 1965. Ariz. Agr. Expt. Sta. Tech. Bul. 187: 1-19 (Ariz. spp.).

— Michener, 1965. Amer. Mus. Nat. Hist., Bul. 130: 185-186 (classification). — Stephen, Bohart and Torchio, 1969. The biology and external morphology of bees, pp. 53-54 (classification).

Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 337-344 (life histories, nests, associates). — Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 38-39, fig. 16 (*Larrea* visiting spp.).

### Genus CHALICODOMA Subgenus CHALICODOMA Lepeletier

*Chalicodoma* Lepeletier, 1841. Hist. Nat. Ins., Hym. 2: 309.

Type-species: *Apis muraria* Fabricius. Desig. by Girard, 1879.

The typical subgenus does not occur in North America.

Genus **CHALICODOMA** Subgenus **CHELOSTOMOIDES** Robertson

*Chelostomoides* Robertson, 1901. Canad. Ent. 33: 231.

Type-species: *Chelostoma rugifrons* Smith. Monotypic and orig. desig. (= *Megachile rufimanus* Robertson).

*Oligotropus* Robertson, 1903. Amer. Ent. Soc., Trans. 29: 168.

Type-species: *Oligotropus campanulae* Robertson. Monotypic and orig. desig.

*Gnathodon* Robertson, 1903. Amer. Ent. Soc., Trans. 29: 168. Preocc.

Type-species: *Megachile georgica* Cresson. Monotypic and orig. desig.

*Sarogaster* Robertson, 1918. Ent. News 29: 92. Proposed to replace *Gnathodon* Robertson.

Taxonomy: Michener, 1953. Kans. Univ. Sci. Bul. 35: 1059, figs. 162-164 (larva). — Mitchell,

1956. Pan-Pacific Ent. 32: 134-138 (revised key to spp.). — Medler and Lussenhop, 1968.

Wis. Univ. Res. Bul. 274: 30-32 (Wis. spp.).

**adelphodonta** (Cockerell). Ariz.; Mexico (Baja California). Pollen: Unknown, but visits flowers of *Allionia*, *Kallstroemia grandiflora*.

*Megachile adelphodonta* Cockerell, 1924. Calif. Acad. Sci., Proc. (4) 12: 548. ♂.

*Megachile (Chelostomoides) tucsonensis* Mitchell, 1956. Pan-Pacific Ent. 32: 133. ♀.

**angalarum** (Cockerell). B. C., Wash., Calif., Nev., Ariz. Parasite: *Sapyga angustata* (Cress.). Pollen: Polylectic, visits a wide variety of flowers including *Achillea millefolium*, *Adenostegia villosa*, *Amorpha californica*, *Aster adscendens*, *A. canescens*, *Astragalus parishii*, *Brassica incana*, *Calycadenia multiglandulosa*, *Centaurea solstitialis*, *Cercidium torreyanum*, *Chamaenerion angustifolium*, *Chrysopsis fastigiata*, *C. fremontii*, *C. villosa*, *Chrysothamnus nauseosus*, *Clarkia unguiculata*, *Cirsium vulgare*, *Collinsia tinctoria*, *Cordylanthus filifolius*, *C. nevadensis*, *C. pilosus*, *C. rigidus*, *Corethrogyne filaginifolia*, *Cryptantha ambigua*, *C. denticulata*, *C. intermedia*, *Dicentra chrysanthra*, *Encelia farinosa*, *Eriodictyon*, *Eriogonum fasciculata*, *E. f. var. polifolium*, *E. latifolium* var. *nudum*, *E. subscaposum*, *E. wrightii*, *Erysimum asperum*, *Franseria*, *Geranium richardsonii*, *Gilia capitata*, *Glycyrrhiza lepidota*, *Grindelia camporum*, *G. hallii*, *Haplopappus arborecens*, *Helianthus gracilentus*, *Heliotropium curvicaule*, *Horkelia bernardina*, *H. bolanderi* var. *parryi*, *Lathyrus*, *Lessingia leptoclada*, *Lonicera interrupta*, *Lotus americanus*, *L. argophyllus*, *L. crassifolius*, *L. davidsonii*, *L. glaber*, *L. humistratus*, *L. nevadensis*, *L. oblongifolius*, *L. scoparius*, *L. torreyi*, *Lupinus austromontanus*, *L. longipes*, *Marrubium vulgare*, *Melilotus alba*, *M. officinalis*, *Mentzelia laevicaulis*, *Monardella lanceolata*, *M. linoides*, *M. stricta*, *Penstemon bridgesii*, *P. grinnellii*, *P. palmeri*, *P. rothrockii*, *Perideridia gairdneri*, *Phacelia heterophylla*, *P. imbricata*, *P. ramosissima*, *Potentilla bernardina*, *P. glandulosa*, *ranunculus*, *Rhamnus californica*, *Rudbeckia californica*, *Salvia apiana*, *S. pachyphylla*, *Solidago californica*, *S. confinis*, *S. occidentalis*, *Stachys albens*, *S. pycnantha*, *Sweetia parryi*, *Symphoricarpos*, *Trichostema laxum*, *T. parishii*, *Trifolium variegatum*, *Verbena californica*, *V. prostrata*, *Vitex*.

*Megachile angalarum* Cockerell, 1902. South. Calif. Acad. Sci., Bul. 1: 70. ♀.

**browni** (Mitchell). Ariz., south. Calif.; Mexico (Baja California). Pollen: Unknown, but visits flowers of *Acacia greggii*, *Asclepias*, *Canotia*, *Dalea*, *Frankenia palmieri*, *Opuntia*, *Prosopis juliflora*.

*Megachile (Chelostomoides) browni* Mitchell, 1934. Amer. Ent. Soc., Trans. 53: 354. ♂.

*Megachile (Chelostomoides) felipiana* Mitchell, 1937. Amer. Ent. Soc., Trans. 63: 405. ♀.

Taxonomy: Timberlake, 1957. Pan-Pacific Ent. 33: 132 (synonymy).

**campanulae campanulae** (Robertson). Que. and Mass. to Fla., west to Iowa, Wis., Minn., Nebr., Kans. and Tex. Ecology: Nests in borings. Pollen: Unknown, but visits flowers of *Asclepias*, *Baptisia tinctoria*, *Campanula americana*, *C. campanulae*, *C. rotundifolia*, *Desmodium canadense*, *Epilobium angustifolium*, *Galactia*, *Helianthus*, *Lobelia*, *Lythrum*, *Malva sylvestris*, *Melilotus*, *Nepeta*, *Oenothera*, *Psoralea*, *Pycnanthemum*, *Rudbeckia*, *Solidago*, *Strophostyles*, *Symphoricarpos*, *Verbena*, *Veronica stricta*.

*Oligotropus campanulae* Robertson, 1903. Amer. Ent. Soc., Trans. 29: 171. ♀, ♂.

Biology: Rau, 1926. Acad. Sci. St. Louis, Trans. 25: 202 (nest). — Krombein, 1967.

Trap-nesting wasps and bees, p. 341 (life history, nest architecture). — Medler and Lussenhop, 1968. Wis. Univ. Res. Bul. 274: 31 (nest).

- campanulae wilmingtوني** (Mitchell). Fla. to Va., coastal. Ecology: Nests in borings. Parasite: *Coelioxys modesta* Sm. Pollen: Unknown, but visits flowers of *Galactia*, *Melilotus*, *Pontederia*, *Solidago*, *Strophostyles*.  
*Oligotropus wilmingtوني* Mitchell, 1924. Elisha Mitchell Sci. Soc., Jour. 40: 156. ♀, ♂.  
 Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 341-342 (life history, nest architecture, parasite).
- chilopsidis** (Cockerell). Tex., N. Mex., Ariz., Calif., Mexico, deserts. Parasite: *Nemognatha scutellaris* Lec. Pollen: Apparently polylectic, visits flowers of *Acacia greggii*, *Cercidium floridum*, *C. microphyllum*, *C. torreyanum*, *Chilopsis linearis*, *Cirsium*, *Dalea californica*, *D. spinosa*, *Encelia farinosa*, *Helianthus*, *Heliotropium curassavicum*, *Hoffmanseggia*, *Larrea tridentata*, *Marrubium vulgare*, *Medicago sativa*, *Melilotus alba*, *Mimosa*, *Olneya tesota*, *Prosopis glandulosa* var. *torreyanum*, *Sapindus*, *Senecio*, *Vauquelinia*, *Verbesina encelioides*.  
*Lithurgus oblongus* Fox, 1893. Calif. Acad. Sci., Proc. (2) 4: 20. ♀. Preocc.  
*Megachile chilopsidis* Cockerell, 1900. Ann. and Mag. Hist. (7) 6: 17. ♀.  
*Megachile longula* Fox, 1902. Ent. News 13: 137. N. name.  
*Megachile pratti* Cockerell, 1913. Ann. and Mag. Nat. Hist. (8) 11: 541. ♂ (♀ misdet.).  
 Taxonomy: Mitchell, 1956. Pan-Pacific Ent. 32: 129-130 (synonymy). —Timberlake, 1957. Pan-Pacific Ent. 33: 132 (synonymy).  
 Biology: Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 38 (floral relationships).
- davidsoni** (Cockerell). South. Calif., Ariz. Pollen: Possibly oligolectic on *Dicentra* including *D. chrysantha*, but visits other flowers including *Fremontia*, *Lupinus austromontanus*, *Penstemon*, *Senecio*.  
*Megachile davidsoni* Cockerell, 1902. South. Calif. Acad. Sci., Bul. 1: 70. ♀.  
*Megachile occidentalis* var. *leucotricha* Cockerell, 1902. South. Calif. Acad. Sci., Bul. 1: 137. ♂.
- discorhina** (Cockerell). Calif., Ariz., N. Mex.; Mexico (Baja California). Parasite: *Leucospis affinis* Say. Pollen: Polylectic, visits flowers of *Acacia greggii*, *Baileya*, *Cercidium floridum*, *C. torreyanum*, *Coursetia*, *Dalea schottii*, *Encelia farinosa*, *Hyptis emoryi*, *Larrea tridentata*, *Lepidium*, *Medicago sativa*, *Melilotus*, *Prosopis glandulosa* var. *torreyanum*, *Senecio*, *Sphaeralcea ambigua*.  
*Megachile discorhina* Cockerell, 1924. Calif. Acad. Sci., Proc. (4) 12: 549. ♀.  
 Taxonomy: Mitchell, 1956. Pan-Pacific Ent. 32: 131 (tax. status).  
 Biology: Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 38-39, fig. 16 (floral relationships).
- exilis exilis** (Cresson). Tex., N. Mex., Ariz. Pollen: Unknown, but visits flowers of *Baptisia tinctoria*, *Chilopsis*, *Coreopsis*, *Dalea*, *Lespedeza repens*, *Melilotus*, *Polygala*, *Tephrosia virginiana*.  
*Megachile exilis* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 265. ♂.  
*Megachile studiosa* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 269. ♀.
- exilis parexilis** (Mitchell). Md., Va., N. C., Ga., Fla., Ind., Ala., Miss., Ark., Tex., Ariz. Ecology: Nests in borings. Pollen: Unknown, but visits flowers of *Asclepias*, *Baccharis*, *Baptisia*, *Ceanothus*, *Chilopsis*, *Condalia*, *Crotalaria*, *Erigeron*, *Galactia*, *Hydrolea*, *Ilex*, *Melilotus*, *Mentha*, *Monarda*, *Oenothera*, *Phaseolus*, *Rhus*, *Tephrosia*, *Trifolium*, *Vaccinium*, *Vicia*.  
*Megachile* (*Chelostomoides*) *exilis* var. *parexilis* Mitchell, 1937. Amer. Ent. Soc., Trans. 63: 393. ♂.  
 Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 339-340 (life history, nest architecture).
- georgica** (Cresson). N. J. to Fla., west to Ark. and Tex. Ecology: Nests in borings. Parasite: *Coelioxys modesta* Sm., *Leucospis affinis floridana* Cress. Pollen: Unknown, but visits flowers of *Azelia cassinoides*, *Amorpha*, *Baptisia tinctoria*, *Chrysopsis*, *Clethra alnifolia*, *Crotalaria*, *Desmodium*, *Erigeron*, *Galactia*, *Helenium*, *Hypericum*, *Lobelia*,

*Melilotus*, *Penstemon*, *Phaseolus*, *Psoralea*, *Pycnanthemum hypsifolia*, *Stachys*, *Strophostyles*, *Tephrosia virginiana*, *Vaccinium*.

*Megachile georgica* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 123. ♀, ♂.

*Megachile penicillata* Cockerell, 1915. Ann. and Mag. Nat. Hist. (8) 15: 536. ♀.

Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 337-339 (life history, nest architecture, supersedure, parasite).

**lobatifrons** (Cockerell). N. Mex., Ariz., south. and east. Calif., Mexico. Pollen: Unknown, but visits flowers of *Acacia greggii*, *Cercidium*, *Dalea emoryi*, *Eriogonum fasciculatum*, *E. trichopes*, *Larrea tridentata*, *Olneya tesota*, *Prosopis glandulosa* var. *torreyanum*, *P. pubescens*, *Wislizenia refracta*.

*Megachile lobatifrons* Cockerell, 1924. Calif. Acad. Sci., Proc. (4) 12: 547. ♀, ♂.

**manni** (Mitchell). Ariz.

*Megachile (Chelostomoides) manni* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 355. ♀, ♂.

**occidentalis** (Fox). Tex., N. Mex., Ariz., south. Calif.; Mexico; deserts. Ecology: Nests in adobe and brick walls as well as in dead wood of a pepper tree and trap nests. Parasite:

*Nemognatha lurida* LeC. Pollen: Unknown, but visits flowers of *Caleopsis*, *Cercidium torreyanum*, *Chilopsis linearis*, *Cleome*, *Croton californicus*, *Duranta plumieri*, *Geraea canescens*, *Helianthus*, *Hoffmanseggia densiflora*, *Larrea tridentata*, *Lotus*, *Marrubium vulgare*, *Medicago sativa*, *Nolina parryi*, *Phacelia*, *Phyla nodiflora*, *Pluchea camphorata*, *Prosopis*, *Schinus molle*, *Ruellia*, *Senecio*, *Tamarix gallica*, *Verbesina*, *Vernonia*, *Vicia cracca*, *Wislizenia refracta*.

*Megachile occidentalis* Fox, 1894. Calif. Acad. Sci., Proc. (2) 4: 117. ♂.

*Megachile prosopidis* Cockerell, 1900. Ann. and Mag. Nat. Hist. (7) 6: 16. ♀.

*Megachile prosopidis* var. *testudinis* Cockerell, 1924. Calif. Acad. Sci., Proc. (4) 12: 550. ♀.

Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 343-344 (life history, nest architecture, supersedure). — Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 39 (floral relationships).

**odontostoma** (Cockerell). N. Mex., Ariz., south. Calif., Mexico, deserts. Pollen: Unknown, but visits flowers of *Acacia greggii*, *Asclepias*, *Baileya*, *Cercidium floridum*, *Chaenactis stevioides*, *Encelia farinosa*, *Helianthus*, *Heliotropium*, *Lepidium*, *Medicago sativa*, *Melilotus*, *Palafioria linearis*, *Prosopis glandulosa* var. *torreyanum*, *Senecio*, *Verbesina encelioides*.

*Megachile odontostoma* Cockerell, 1924. Calif. Acad. Sci., Proc. (4) 27: 550. ♀.

*Megachile (Chelostomoides) duplexa* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 353. ♂.

Taxonomy: Mitchell, 1956. Pan-Pacific Ent. 32: 131 (synonymy).

**rugifrons** (Smith). N. C., Ga., Fla., Mich., Ill., Nebr., Kans., Ark., Tex. Pollen: Unknown, but visits flowers of *Apocynum*, *Blephilia*, *Coreopsis*, *Erigeron*, *Hypericum*, *Lobelia*, *Nepeta*, *Pontederia*, *Psoralea*, *Tephrosia*, *Vaccinium*, *Verbena*, *Veronicastrum virginicum*.

*Chelostoma rugifrons* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 220. ♀.

*Chelostomoides rugifrons* Cockerell, 1904. Canad. Ent. 36: 301. ♀.

*Megachile rufimanus* Robertson, 1891. Amer. Ent. Soc., Trans. 18: 65. ♀, ♂.

**spinotulata** (Mitchell). Tex., N. Mex., Ariz., south. Calif. Parasite: *Leucospis affinis* Say.

Pollen: Polylectic, visits flowers of *Adenostegia filifolia*, *Allionia*, *Asclepias erosa*, *Boerhaavia spicata*, *Calochortus splendens*, *Cercidium*, *Chrysopsis fastigiata*, *Cordylanthus filifolius*, *C. nevini*, *C. rigidus*, *Croton californicus*, *Cryptantha*, *Dalea californica*, *Eriodictyon*, *Eriogonum fasciculatum*, *E. inflatum*, *E. subscaposum*, *E. trichopes*, *Geranium*, *Helianthus*, *Lotus americanus*, *L. argophyllus*, *L. hamatus*, *L. scoparius*, *Marrubium vulgare*, *Mentzelia laevicaulis*, *Phacelia ramosissima*, *Robinia*, *Senecio*, *Sapindus*, *Sweetia parryi*.

*Megachile (Chelostomoides) spinotulata* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 357. ♀, ♂.

Biology: Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 39 (floral relationships).

**subexilis** (Cockerell). Nebr., Colo., N. Mex., Utah, Ariz., Nev., Calif. Ecology: Nests in adobe wall and also in borings. Parasite: *Coelioxys gilensis* Ckll., *Dioxys pomonae* Ckll. Pollen:

Unknown, but visits flowers of *Amorpha*, *Chamaebatia millefolium*, *Geranium*, *Helianthus*, *Lathyrus odoratus*, *Lotus*, *Marrubium vulgare*, *Medicago sativa*, *Melilotus*, *Monarda*, *Opuntia*, *Phacelia*, *Phaseolus*, *Psoralea tenuiflora*, *Salvia*, *Trifolium*, *Verbesina encelioides*, *Vicia*.

*Megachile subexilis* Cockerell, 1908. Entomologist 41: 292. ♀.

*Megachile semixilis* Cockerell, 1908. Entomologist 41: 292. ♀, ♂.

Biology: Hicks, 1927. Ent. News 38: 17-21 (nest architecture, parasite). — Hurd, 1958. Calif. Univ. Pubs. Ent. 14: 273 (parasite). — Krombein, 1967. Trap-nesting wasps and bees, p. 343 (life history, nest architecture).

**subspinotulata** (Mitchell). Ariz.

*Megachile (Chelostomoides) subspinotulata* Mitchell, 1934. Amer. Ent. Soc., Trans. 59: 360. ♀.

**texensis** (Mitchell). Tex. (Southmost in Cameron Co.). Pollen: Unknown, but visits flowers of *Parkinsonia*.

*Megachile (Chelostomoides) texensis* Mitchell, 1956. Pan-Pacific Ent. 32: 132. ♀.

### Genus CHALICODOMA Subgenus PSEUDOMEGACHILE Friese

*Megachile* subg. *Pseudomegachile* Friese, 1899. Die Bienen Europas 5: 36.

Type-species: *Megachile ericetorum* Lepeletier. Desig. by Alfken, 1933.

*Megachile* subg. *Archimegachile* Alfken, 1933. Konowia 12: 56.

Type-species: *Megachile flavipes* Spinola. Orig. desig.

Taxonomy: Pasteels, 1965. Mus. Royal l'Afrique Cent., An. ser. 8, Zool. 137: 377 (synonymy).

**lanata** (Fabricius). Fla. (Miami). Ecology: Builds clay cells in cavities. An Indian species, probably introduced into U. S. from Cuba, where it is also adventive.

*Apis lanata* Fabricius, 1775. Systema Ent., p. 385. ♀.

*Apis purpurea* Christ, 1791. Naturgesch. Insekt. Bienen, Wespen u. Ameisengeschl., p. 168, pl. 13, fig. 7.

*Megachile Martindalei* Fox, 1891. Amer. Ent. Soc., Trans. 18: 344. ♀, ♂.

Taxonomy: Moure, 1960. Studia Ent. 3: 108-109 (notes on type). — Pasteels, 1965. Mus. Royal l'Afrique Cent., An. ser. 8, Zool. 137: 402-404 (synonymy).

Biology: Horne, 1870. Zool. Soc. London, Trans. 7: 176-177, pl. 19, figs. 11, 11a, 11b. — Bodkin, 1918. Ent. Soc. London, Trans. p. 303.

### Genus COELIOXYS Latreille

These bees are primarily cleptoparasitic in the nests of *Megachile*, but some species have been reared from the nests of *Chalicodoma* as well as other bees including *Xylocopa* in India.

Revision: Mitchell, 1973. N. C. State Univ., Contrib. Dept. Ent. 129 pp., 61 figs., frontis.

(subgenera of Western Hemisphere). — Baker, 1975. Kans. Univ. Sci. Bul. 50: 649-730, 49 figs., 1 table (Nearctic spp. of subg. *Boreocoelioxys*, *Coelioxys*, *Schizocoelioxys*, *Xerocoelioxys*).

Taxonomy: Cockerell, 1905. Psyche 12: 87. — Cockerell, 1912. Canad. Ent. 44: 168.

— Crawford, 1914. Ent. Soc. Amer., Ann. 7: 148. — Sladen, 1915. Canad. Ent. 47: 205

(Ontario spp.). — Cockerell, 1921. Amer. Mus. Novitates 21: 7. — Cockerell, 1925.

Pan-Pacific Ent. 1: 150. — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 192-232, figs. 1, 63-66, table 7 (eastern U. S. spp.). — Baker, 1971. Kans. Ent. Soc., Jour. 44: 225-235, 40 figs.; 1 table (larval development and sexual dimorphism).

Biology: Graenicher, 1927. Ent. News 38: 231-235, 273-276 (life history)

Morphology: Pasteels and Pasteels, 1971. Acad. Sci. Paris, Compt. Rend. 273: 1580-1581 (structure of tergal plates).

### Genus COELIOXYS Subgenus COELIOXYS Latreille

*Coelioxys* Latreille, 1809. Gen. Crust. Ins., v. 4, p. 166.



Type-species: *Apis quadridentata* Linnaeus. Desig. by Latreille, 1810.

(= *Anthophora conica* Fabricius = *Apis conica* Linnaeus).

*Coelioxys* subg. *Paracoelioxys* Gribodo, 1884. Soc. Ent. Ital., Bol. 16: 274.

Type-species: *Coelioxys montandoni* Gribodo. Monotypic.

*Paracoelioxys* Radoszkowski, 1893. Soc. Ent. Rossica, Horae 27: 53. Preocc.

Type-species: *Paracoelioxys barrei* Radoszkowski. Desig. by Sandhouse, 1943.

*Coelioxys* subg. *Liothyrapis* Cockerell, 1911. U. S. Natl. Mus., Proc. 40: 246.

Type-species: *Coelioxys apicata* Smith. Monotypic. (= *Coelioxys decipiens* Spinola).

*Coelioxys* subg. *Hemicoelioxys* Pasteels, 1968. Mus. Roy. l' Afr. Centr., Ann. Sci. Zool. (8) 167: 133.

Type-species: *Coelioxys (Hemicoelioxys) gracilis* Pasteels. Monotypic and orig. desig.

**hirsutissima** Cockerell. Tex. to Calif.

*Coelioxys hirsutissima* Cockerell, 1912. Canad. Ent. 44: 168. ♂.

**immaculata** Cockerell. Mass. to Fla., Ind., Kans., Okla., Ark., Tex.

*Coelioxys immaculata* Cockerell, 1912. Canad. Ent. 44: 165. ♂.

*Coelioxys sculptifrons* Crawford, 1914. Ent. Soc. Amer., Ann. 7: 153. ♀.

**mittelli** Baker. N. C., Fla., Kans., Nev., Calif.

*Coelioxys (Coelioxys) mittelli* Baker, 1975. Kans. Univ. Sci. Bul. 50: 726, figs. 42B, 43, 46H-I. ♀, ♂.

**serricauda** Baker. Wash., Oreg., Calif.

*Coelioxys (Coelioxys) serricauda* Baker, 1975. Kans. Univ. Sci. Bul. 50: 728, figs. 45B, F, H, 46J, 49. ♀, ♂.

**sodalis** Cresson. Alaska and N. W. T., south to Calif., Ariz. and N. Mex. in the west and Great Lakes and New England states in the east. Host: *Megachile frigida* Sm., *M.*

*melanophaea* Sm., *M. melanophaea wootoni* Ckll., *M. pacifica* (Panz.), *M. texana* Cress.

*Coelioxys sodalis* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 99. ♂.

*Coelioxys ribis* Cockerell, 1900. Canad. Ent. 32: 301. ♀.

*Coelioxys ribis* var. *kincaidii* Cockerell, 1904. Ann. and Mag. Nat. Hist. (7) 13: 33. ♀.

Biology: Hicks, 1926. Colo. Univ., Studies 15: 226 (searching behavior, as *quadridentata*).

—Graenicher, 1927. Ent. News 38: 233, 273 (host, as *ribis*). —Graenicher, 1935. Ent. Soc. Amer., Ann. 28: 300, 304 (life history, as *ribis*). —Medler and Lussenhop, 1968. Wis. Univ. Res. Bul. 274: 58 (host). —Hobbs, 1968. Canad. Ent. 100: 781 (host).

### Genus COELIOXYS Subgenus BOREOCOELIOXYS Mitchell

*Coelioxys* subg. *Boreocoelioxys* Mitchell, 1973. N. C. State Univ., Contrib. Dept. Ent. p. 37.

Type-species: *Coelioxys rufitarsis* Smith. Orig. desig.

**banksi** Crawford. Que. to N. C., west to B. C., south to N. Mex., Ariz. and Calif. Host:

*Megachile relativa* Cress.

*Coelioxys banksi* Crawford, 1914. Ent. Soc. Amer., Ann. 7: 155. ♀.

*Coelioxys angulifera* Cockerell, 1916. Pomona Col. Jour. Ent. Zool. 8: 61. ♀, ♂.

Biology: Medler and Koerber, 1958. Ent. Soc. Amer., Ann. 51: 343 (life history, host).

**insita** Cresson. Nebr. to Tex., west to Colo., N. Mex. and east. Ariz.

*Coelioxys insita* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 273. ♀.

*Coelioxys rudis* Cockerell, 1934. Amer. Mus. Novitates 732: 3. ♀, ♂.

**moesta** Cresson. N. S. south to Va., west to N. W. T. and Alaska, south to Calif., Ariz., and N.

Mex. Host: *Megachile centuncularis* (Linn.), *M. concinna* Sm., *M. frigida* Sm., *M.*

*pacifica* (Panz.), *M. relativa* Cress., *M. texana* Cress.

*Coelioxys moesta* Cresson, 1864. Ent. Soc. Phila., Proc. 2: 403. ♀.

*Coelioxys tristis* Provancher, 1882. Nat. Canad. 13: 241. ♀.

*Coelioxys maesta* (!) Dalla Torre, 1896. Cat. Hym., v. 10, p. 488.

*Coelioxys lutzi* Cockerell, 1921. Amer. Mus. Novitates 21: 5. ♀, ♂.

Taxonomy: Bohart, 1970. Utah State Univ. 41st Faculty Honor Lecture, p. 9 (immatures).

- Biology: Graenicher, 1927. Ent. News 38: 233, 274 (life history, host). — Medler and Koerber, 1958. Ent. Soc. Amer., Ann. 51: 337, 343 (life history, host). — Medler, 1959. Canad. Ent. 9: 114-115 (life history, host). — Medler and Lussenhop, 1968. Wis. Univ. Res. Bul. 274: 54 (host). — Hobbs, 1968. Canad. Ent. 100: 781 (host).
- novomexicana** Cockerell. Tex. west to Calif. and Oreg.; Mexico (Chihuahua, Durango, Nuevo Leon and Tamaulipas). Host: *Megachile brevis* Say, *M. gentilis* Cress., *M. pacifica* (Panz.), *M. sidalceae* Ckll.
- Coelioxys sayi* var. *novomexicana* Cockerell, 1909. Ent. News 20: 9. ♀.
- Taxonomy: Cockerell, 1921. Amer. Mus. Novitates 21: 1. ♂.
- Biology: Bechtel, 1958. Pan-Pacific Ent. 34: 12-13 (host).
- octodentata** Say. Transcont. U. S. and south. Canada; Mexico. Host: *Megachile brevis* Say, *M. centuncularis* (Linn.), *M. mendica* Cress., *M. onobrychidis* Ckll., *M. pacifica* (Panz.), *M. perihirta* Ckll., *M. texana* Cress.
- Coelioxys 8-dentata* Say, 1824. In Keating, Narr. Long's 2nd Exped., v. 2, p. 353. ♂.
- Coelioxys brevis* Cresson, 1864. Ent. Soc. Phila., Proc. 2: 402. ♀, ♂. Preocc.
- Coelioxys altilis* Cresson, 1879. Amer. Ent. Soc., Trans. 7: 219. N. name for *brevis* Cresson.
- Coelioxys cressoni* Dalla Torre, 1896. Cat. Hym., v. 10, p. 485. N. name for *brevis* Cresson.
- Coelioxys coquillettii* Crawford, 1914. Ent. Soc. Amer., Ann. 7: 157, fig. ♀.
- Coelioxys megatricha* Cockerell, 1916. Pomona Col. Jour. Ent. Zool. 80: 60. ♂.
- Coelioxys crassula* Cockerell, 1919. Canad. Ent. 51: 27. ♀.
- Coelioxys mediata* Cockerell, 1925. Pan-Pacific Ent. 1: 146. ♀, ♂.
- Coelioxys catalinica* Cockerell, 1940. South. Calif. Acad. Sci., Bul. 38: 136. ♂.
- Coelioxys atlantica* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 198, fig. 65. ♀, ♂.
- Taxonomy: Michener, 1953. Kans. Univ. Sci. Bul. 35: 1060, figs. 159-161, 165, 166 (larva). — Stephen, Bohart and Torchio, 1969. The biology and external morphology of bees, p. 29 (immatures). — Baker, 1971. Kans. Ent. Soc., Jour. 44: 225-235, figs. (immatures).
- Biology: Fox, 1900. Ent. News 11: 553 (host). — Hicks, 1926. Colo. Univ., Studies 15: 227 (life history, host). — Robertson, 1926. Psyche 33: 116 (host). — Graenicher, 1935. Ent. Soc. Amer., Ann. 28: 300, 304 (host). — Michener, 1953. Kans. Univ. Sci. Bul. 35: 1737-1742, figs. 24-26 (life history, host, immature stages). — Linsley, 1958. Hilgardia 27: 582 (ecology). — Medler, 1965. Ent. Soc. Wash., Proc. 67: 113-115 (life history, host). — Medler and Lussenhop, 1968. Wis. Univ. Res. Bul. 274: 55 (hosts).
- porterae** Cockerell. Newfoundland, south to N. C., west to B. C., south to Calif., Ariz. and N. Mex. Host: *Megachile frigida* Sm., *M. relativa* Cress.
- Coelioxys porterae* Cockerell, 1900. Canad. Ent. 32: 298. ♀.
- Coelioxys dubitata* var. *melanopoda* Viereck, 1917 (1916). Conn. State Geol. and Nat. Hist. Survey, Bul. 22: 747. ♂.
- Coelioxys hypodonta* Cockerell, 1925. Pan-Pacific Ent. 1: 150. ♂.
- pratti** Crawford. Tex. (Kerrville); Mexico and Cent. Amer.
- Coelioxys pratti* Crawford, 1914. Ent. Soc. Amer., Ann. 7: 159. ♀.
- rufitarsis** Smith. Transcont. U. S. and south. Canada; Mexico. Host: *Megachile fortis* Cress., *M. latimanus* Say, *M. melanophaea* Sm., *M. m. wootoni* Ckll., *M. montivaga* Cress., *M. perihirta* Ckll., *M. texana* Cress.
- Coelioxys rufitarsis* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 271. ♂.
- Coelioxys dubitata* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 272. ♀.
- Coelioxys comstockii* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 96. ♀.
- Coelioxys coloradensis* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 98. ♂.
- Coelioxys rufitarsis rhois* Cockerell, 1903. Ann. and Mag. Nat. Hist. (7) 12: 452. ♀.
- Coelioxys rufitarsis claripes* Cockerell, 1925. Pan-Pacific Ent. 1: 146. ♂.
- Biology: Graenicher, 1905. Wis. Nat. Hist. Soc., Bul. 3: 162-163 (host). — Graenicher, 1906. Wis. Nat. Hist. Soc., Bul. 4: 138 (life history, host). — Robertson, 1926. Psyche 33: 116 (host). — Hicks, 1926. Colo. Univ., Studies 15: 230, 233 (as *coloradensis* and *rufitarsis*). — Graenicher, 1927. Ent. News 38: 233 (life history, host). — Graenicher, 1935. Ent. Soc. Amer., Ann. 28: 300, 304 (host, as *dubitata*). — Medler and Lussenhop, 1968. Wis. Univ. Res. Bul. 274: 57 (life history).

**salinaria** Cockerell. Utah. Host: *Megachile brevis* Say.

*Coelioxys salinaria* Cockerell, 1925. Pan-Pacific Ent. 1: 148. ♂.

**sayi** Robertson. N. Y. to Fla., west to Nebr., Colo. and Ariz. Host: *Megachile brevis* Say, *M. mendica* Cress.

*Coelioxys sayi* Robertson, 1897. Acad. Sci. St. Louis, Trans. 7: 346. ♀, ♂.

*Coelioxys mendicina* Cockerell, 1921. Amer. Mus. Novitates 21: 3. ♀, ♂.

Biology: Krombein, 1967. Trap-nesting wasps and bees, p. 483 (host).

### Genus COELIOXYS Subgenus XEROCOELIOXYS Mitchell

*Coelioxys* subg. *Xerocoelioxys* Mitchell, 1973. N. C. State Univ., Contrib. Dept. Ent. p. 44.

Type-species: *Coelioxys edita* Cresson. Orig. design.

**aperta** Cresson. Colo., N. Mex., Ariz.; Mexico (Jalisco).

*Coelioxys aperta* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 95, fig. ♀.

Taxonomy: Cockerell, 1921. Amer. Mus. Novitates 21: 4. ♂.

**bisoncornua** Hill. Nebr., Minn., Kans.

*Coelioxys bisoncornua* Hill, 1936. Ent. News 47: 205. ♀, ♂.

**boharti** Mitchell. Fla. (Cocoa and Labelle), Tex. (College Station).

*Coelioxys boharti* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 206. ♀.

**edita** Cresson. Fla., Ill., Mo., Ark., and Tex., west to Alta., Wash., Oreg. and Calif.; Mexico.

*Coelioxys edita* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 272. ♂.

*Coelioxys deplanata* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 96. ♀.

Biology: Linsley, 1962. Ent. Soc. Amer., Ann. 55: 160-161, fig. 7 (sleep).

**galactiae** Mitchell. N. C., Fla., Ill.

*Coelioxys galactiae* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 204, figs. 65, 66. ♀, ♂.

**grindeliae** Cockerell. N. Dak. to N. Mex., west to B. C., Wash., Oreg. and Calif. Host:

*Megachile perihirta* Ckll.

*Coelioxys grindeliae* Cockerell, 1900. Canad. Ent. 32: 300. ♀, ♂.

*Coelioxys grindeliae denverensis* Cockerell, 1912. Canad. Ent. 44: 166. ♂.

*Coelioxys lamellicauda* Cockerell, 1921. Amer. Mus. Novitates 21: 6. ♂.

Biology: Hicks, 1925. Colo. Univ., Studies 15: 237 (host).

**mesae** Cockerell. Colo., Utah, Idaho, Oreg. and Wash. Host: *Megachile umatillensis* Mitchell.

*Coelioxys mesae* Cockerell, 1921. Amer. Mus. Novitates 21: 6. ♂.

*Coelioxys flagrata* Baker, 1972. In Bohart and Youssef, Royal Ent. Soc. Lond., Trans. 124: 1, 13-16, 19, figs. 2, 16-19. ♀. N. syn.

Biology: Bohart and Youssef, 1972. Royal Ent. Soc. London, Trans. 124: 1, 13-16, 19, figs. 2, 16-19 (host, life history, immature stages, as *flagrata*).

**nodis** Baker. Ill., Kans. and Nebr.

*Coelioxys* (*Xerocoelioxys*) *nodis* Baker, 1975. Kans. Univ. Sci. Bul. 50: 716. ♂.

**piercei** Crawford. Tex. (Cotulla).

*Coelioxys piercei* Crawford, 1914. Ent. Soc. Amer., Ann. 7: 152, fig. ♀.

**soledadensis** Cockerell. N. Mex., Ariz. Host: *Megachile soledadensis* Cockerell?

*Coelioxys soledadensis* Cockerell, 1909. Ent. News 20: 9. ♂.

### Genus COELIOXYS Subgenus SCHIZOCOELIOXYS Mitchell

*Coelioxys* subg. *Schizocoelioxys* Mitchell, 1973. N. C. State Univ., Contrib. Dept. Ent. p. 50.

Type-species: *Coelioxys funeraria* Smith. Orig. design. and monotypic.

**funeraria** Smith. Alaska, Yukon and B. C., east to N. S., south to Ill., Ind. Pa. and Ga. in the east, and south to Calif., Utah, and N. Mex. in the west. Host: *Megachile frigida* Sm., *M. inermis* Prov., *M. latimanus* Say, *M. pacifica* (Panz.), *M. relativa* Cress.

*Coelioxys funeraria* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 272. ♂.

*Coelioxys lateralis* Cresson, 1864. Ent. Soc. Phila., Proc. 2: 405. ♂.

*Coelioxys lucrosa* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 97. ♀.

*Coelioxys hicksi* Cockerell, 1934. Amer. Mus. Novitates 732: 3. ♀.

Biology: Graenicher, 1905. Nat. Hist. Soc. Wis., Bul. 3: 160 (host, as *lucrosa*). —Graenicher, 1927. Ent. News 38: 233 (host, life history, as *lucrosa*). —Graenicher, 1935. Ent. Soc. Amer., Ann. 28: 300, 304 (host, life history, as *lucrosa*). —Medler, 1958. Canad. Ent. 90: 326-327 (host, life history, as *lucrosa*). —Medler and Koerber, 1958. Ent. Soc. Amer., Ann. 51: 343 (host, life history, as *lucrosa*). —Hobbs, 1968. Canad. Ent. 100: 783 (host).

#### Genus COELIOXYS Subgenus SYNOCOELIOXYS Mitchell

*Coelioxys* subg. *Synocoelioxys* Mitchell, 1973. N. C. State Univ., Contrib. Dept. Ent. p. 57.

Type-species: *Coelioxys texana* Cresson. Orig. desig.

*alternata* Say. Que. to N. C., west to B. C., Wash., Utah and Ariz. Host: *Megachile pugnata* Say.

*Coelioxys alternata* Say, 1837. Boston Jour. Nat. Hist. 1: 401. ♀, ♂.

*Coelioxys texana vegana* Cockerell, 1912. Canad. Ent. 41: 166. ♂.

*Coelioxys cockerelli* Crawford, 1915. Insector Inscitiae Menstruus 3: 108. ♀.

*Coelioxys wisconsinensis* Cockerell, 1925. Pan-Pacific Ent. 1: 145. ♀.

Biology: Medler and Lussenhop, 1968. Wis. Univ. Res. Bul. 274: 51-52 (host, life history).

*apacheorum* Cockerell. B. C. to Calif., east to S. Dak., Colo., and Tex.

*Coelioxys apacheorum* Cockerell, 1900. Canad. Ent. 32: 299. ♀.

*Coelioxys fragariae* Cockerell, 1912. Canad. Ent. 44: 167. ♂.

*Coelioxys quercina* Cockerell, 1912. Canad. Ent. 44: 167. ♂.

*erysimi* Cockerell. B. C., Idaho, Oreg., Calif., Nev. and Colo.

*Coelioxys erysimi* Cockerell, 1912. Canad. Ent. 44: 166. ♂.

*hunteri* Crawford. N. Y. to Fla., west to Oreg., Utah and Ariz.; Mexico. Possibly this is the female of *C. floridana* Cress.

*Coelioxys hunteri* Crawford, 1914. Ent. Soc. Amer., Ann. 7: 151, figs. ♀.

*texana* Cresson. Fla., Mo., Kans., Okla. and Tex., west to south. Calif.; Mexico and Cent. Amer.

Host: *Megachile polycaris* Say.

*Coelioxys texana* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 272. ♀.

*Coelioxys texana sonorensis* Cockerell, 1914. Entomologist 47: 116. ♂.

Biology: Schwarz, 1896. Ent. Soc. Wash., Proc. 4: 24 (sleep). —Banks, 1902. N. Y. Ent. Soc., Jour. 10: 212 (sleep). —Robertson, 1926. Psyche 33: 177 (phenology). —Krombein, 1967.

Trap-nesting wasps and bees, pp. 483-484 (host, life history).

#### Genus COELIOXYS Subgenus NEOCOELIOXYS Mitchell

*Coelioxys* subg. *Neocoelioxys* Mitchell, 1973. N. C. State Univ., Contrib. Dept. Ent. p. 64.

Type-species: *Coelioxys assumptionis* Schrottky. Orig. desig.

*menthae* Cockerell. N. Mex., Ariz.; Mexico to El Salvador.

*Coelioxys menthae* Cockerell, 1897. Canad. Ent. 29: 120. ♂.

*slossoni arenicola* Crawford. N. C. to Ga., west to Tex.; Mexico to El Salvador.

*Coelioxys slossoni* var. *arenicola* Crawford, 1914. Ent. Soc. Amer., Ann. 7: 156. ♀, ♂.

*slossoni slossoni* Viereck. Fla.

*Coelioxys slossoni* Viereck, 1902. Canad. Ent. 34: 327. ♀, ♂.

#### Genus COELIOXYS Subgenus MELANOCOELIOXYS Mitchell

*Coelioxys* subg. *Melanocoelioxys* Mitchell, 1973. N. C. State Univ., Contrib. Dept. Ent. p. 78.

Type-species: *Coelioxys tolteca* Cresson. Orig. desig.

*dolichos* Fox. N. C. to Fla. Host: *Megachile xylocopoides* Sm.

*Coelioxys dolichos* Fox, 1890. Ent. News 1: 107. ♀.

Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 482-483 (host, life history).

**Genus COELIOXYS Subgenus HAPLOCOELIOXYS Mitchell**

*Coelioxys* subg. *Haplocoelioxys* Mitchell, 1973. N. C. State Univ., Contrib. Dept. Ent. p. 85.

Type-species: *Coelioxys mexicana* Cresson. Orig. desig.

*mexicana* Cresson. N. C. to Fla., west to Tex.; Mexico.

*Coelioxys mexicana* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 99. ♀, ♂.

*Coelioxys asteris* Crawford, 1914. Ent. Soc. Amer., Ann. 7: 156, fig. ♀.

**Genus COELIOXYS Subgenus GLYPTOCOELIOXYS Mitchell**

*Coelioxys* subg. *Glyptocoelioxys* Mitchell, 1973. N. C. State Univ., Contrib. Dept. Ent. p. 92.

Type-species: *Coelioxys vidua* Smith. Orig. desig.

*germana* Cresson. Ill. to N. J., south to Fla.

*Coelioxys germana* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 102. ♀.

**Genus COELIOXYS Subgenus CYRTOCOELIOXYS Mitchell**

*Coelioxys* subg. *Cyrtocoelioxys* Mitchell, 1973. N. C. State Univ., Contrib. Dept. Ent. p. 106.

Type-species: *Coelioxys costaricensis* Cockerell. Orig. desig.

*angelica* Cockerell. Calif.

*Coelioxys angelica* Cockerell, 1905. Ann. and Mag. Nat. Hist. (7) 15: 201. ♀.

*deani* Cockerell. Colo., Calif.

*Coelioxys deani* Cockerell, 1909. Ent. News 20: 8. ♂.

*floridana* Cresson. Ind. to Fla., west to Tex. This is possibly the male of *C. hunteri* Cwfd.

*Coelioxys floridana* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 98. ♂.

*gilensis* Cockerell. Ariz., Calif., Utah. Host: *Chalicodoma suberilis* (Ckll.).

*Coelioxys gilensis* Cockerell, 1896. N. Mex. Univ., Bul. 1: 62. ♂.

Biology: Hicks, 1927. Ent. News 38: 17 (host).

*gonaspis* Cockerell. Calif.; Mexico (Baja California).

*Coelioxys gonaspis* Cockerell, 1924. Calif. Acad. Sci., Proc. (4) 12: 560. ♀.

*modesta* Smith. Que. and New England States, west to Nebr., south to Fla. and Tex. Host:

*Chalicodoma campanulae wilingtoni* (Mitchell), *C. georgica* (Cress.), *Megachile centuncularis* (Linn.), *M. relativa* Cress.

*Coelioxys modesta* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 271. ♀.

Biology: Graenicher, 1927. Ent. News 38: 233, 274 (host). — Fye, 1965. Canad. Ent. 97: 876 (host). — Krombein, 1967. Trap-nesting wasps and bees, pp. 484-486 (host, validity of previously published host records, life history).

*obtusiventris* Crawford. Fla.

*Coelioxys obtusiventris* Crawford, 1914. Ent. Soc. Amer., Ann. 7: 150. ♀.

*scitula* Cresson. Tex.

*Coelioxys scitula* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 273. ♀, ♂.

**Genus COELIOXYS Subgenus UNASSIGNED**

*asclepiadis* Cockerell. Ariz. Possibly belongs to the subgenus *Cyrtocoelioxys*.

*Coelioxys asclepiadis* Cockerell, 1925. Pan-Pacific Ent. 1: 149. ♂.

**Family ANTHOPHORIDAE**

This is one of the very largest, if not the largest, family of bees in the world. It is present on all the continents, although it is neither as abundant nor as well developed in the Australian and Oriental regions as it is in the Holarctic, Ethiopian and Neotropical regions. The family is exceptionally well represented in the New World by numerous species and is perhaps the most diverse and largest assemblage of these bees in the world. The Anthophoridae contain three subfamilies, the Nomadinae which are cleptoparasites in the nests of pollen-collecting bees, the

Anthophorinae which are chiefly pollen-collecting species, and the Xylocopinae which are also largely pollen-collecting bees. Apart from the cleptoparasites, most anthophorids make their nests in the ground although the majority of the Xylocopinae and some others (e.g., *Clisodon*) nest in wood of various sorts. While many and perhaps most of the pollen-collecting anthophorids are clearly polylectic in their intrafloral relationships, a number of species as well as certain groups of species (e.g., Melitomini, *Peponapis*, *Xenoglossa*, etc.) have established an oligolectic relationship with the flora.

There are more than two dozen tribes of anthophorid bees and, with the exception of the Palaearctic Ammobatoidini and Ancylini, all of these tribes either contain representatives in the New World (11 tribes) or are found only here (14 tribes). Of the tribes found in the New World only the Neotropical Caenoprosopidini, Canephorulini, Eucerinodini, Osirini, Rathymini and Tetrapedini are not known to be present in America north of Mexico.

Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 233-512, figs. 67-127, tables 8-17 (eastern U. S. spp.).

#### SUBFAMILY NOMADINAE

This is a very large, diverse and widespread group of cleptoparasitic bees being found on all the continents and many of the islands. It is especially well represented in the Holarctic, Ethiopian, and Neotropical regions. Members of this subfamily are parasitic in the nests of all families of bees, except the Megachilidae (including the Fidelinae) and the Apidae. All the species of some genera (e.g., *Epeolus*, *Neolarra* and *Triopasites*) are apparently parasitic only in the nests of certain genera of pollen-collecting bees. However, the more usual pattern is that a particular genus (e.g., *Nomada* and *Triepeolus*) has established through its component species a broad spectrum of host relationships involving several genera or families of host bees.

The subfamily contains nearly a dozen tribes and all except the Ammobatoidini, Caenoprosopidini and the Osirini are endemic to or represented in the Nearctic Region.

This subfamily occupies an anomalous position within the family Anthophoridae and perhaps would be better considered as an independent family, a status formerly accorded this group by Linsley and Michener (1939. Amer. Ent. Soc., Trans. 65: 265-305, pls. XV-XVIII). Subsequently it has generally been recognized and treated alternatively as a number of independent tribes assignable either to the subfamily Anthophorinae (e.g., Michener, 1944. Amer. Mus. Nat. Hist., Bul. 82: 270-271) or to the subfamily Nomadinae in the family Anthophoridae (e.g., Michener, 1974. The social behavior of bees, Chapter 2, fig. 2.2). The limits of several tribes are imperfectly known (e.g., Epeolini, Osirini, etc.) and therefore a thorough reevaluation of the position and classification of these cleptoparasitic bees treated here as a subfamily of the Anthophoridae is clearly indicated. Superficially at least, it appears that these bees bear the same relationship within the superfamily Apoidea as do the Sapygidae within the superfamily Scoliidea.

Revision: Linsley and Michener, 1939. Amer. Ent. Soc., Trans. 65: 265-305 (classification).

Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 338-437, figs. 98-107, tables 11-13 (eastern U. S. spp.). — Rozen, 1966. Amer. Mus. Novitates 2244: 1-38, 83 figs. (larva).

#### TRIBE BIASTINI

Included in this tribe are two genera, *Biastes* which occurs in the Palaearctic Region and *Neopasites* which is found only in the Nearctic Region.

Taxonomy: Rozen, 1966. Amer. Mus. Novitates 2244: 33-36, figs. 72-78 (larva).

#### Genus NEOPASITES Ashmead

Revision: Linsley, 1943. Amer. Ent. Soc., Trans. 69: 141 (as *Gnathopasites*).

Taxonomy: Michener, 1953. Kans. Univ. Sci. Bul. 35: 1067, figs. 180-185 (larva).

#### Genus NEOPASITES Subgenus NEOPASITES Ashmead

*Neopasites* Ashmead, 1898. Psyche 8: 284.

Type-species: *Phileremus fulviventris* Cresson. Monotypic and orig. desig.

*Gnathopasites* Linsley and Michener, 1939. Amer. Ent. Soc., Trans. 65: 272.

Type-species: *Phileremus fulviventris* Cresson. Orig. desig.

**fulviventris** (Cresson). Calif. Host: *Dufourea dentipes* Bohart?

*Phileremus fulviventris* Cresson, 1873. Amer. Ent. Soc., Trans. 8: 83. ♂.

**sierrae** (Linsley). Calif.

*Gnathopasites (Gnathopasites) sierrae* Linsley, 1943. Amer. Ent. Soc., Trans. 6: 144. ♀, ♂.

#### Genus NEOPASITES Subgenus MICROPASITES Linsley

*Gnathopasites* subg. *Micropasites* Linsley, 1942. Pan-Pacific Ent. 18: 130.

Type-species: *Neopasites cressoni* Crawford. Monotypic and orig. desig.

An undescribed species of this subgenus has been reared from *Dufourea (Halictoides) trochantera* Bohart.

**cressoni** Crawford. Calif., Ariz. Host: *Dufourea mulleri* (Ckll).

*Neopasites cressoni* Crawford, 1916. Insecutor Inscitiae Menstruus 4: 136. ♂.

Taxonomy: Rozen, 1966. Amer. Mus. Novitates 2244: 33-36, figs. 72-83 (larva).

Biology: Torchio, Rozen, Bohart and Favreau, 1967. N. Y. Ent. Soc., Jour. 75: 143-145, figs.

7-9 (adult activity, oviposition, egg, host).

**mojavensis** (Linsley). Calif.

*Gnathopasites (Micropasites) mojavensis* Linsley, 1943. Amer. Ent. Soc., Trans. 69: 148. ♀.

**timberlakei** (Linsley). Calif.

*Gnathopasites (Micropasites) timberlakei* Linsley, 1943. Amer. Ent. Soc., Trans. 69: 147. ♀, ♂.

#### TRIBE TOWNSENDIELLINI

*Townsendiella* is the only genus included in this tribe and, so far as known, the species are cleptoparasites in the nests of *Conanthalictus* and *Hesperapis*.

#### Genus TOWNSENDIELLA Crawford

Revision: Linsley, 1943. Amer. Ent. Soc., Trans. 69: 93 (included spp.).

#### Genus TOWNSENDIELLA Subgenus TOWNSENDIELLA Crawford

*Townsendiella* Crawford, 1916. Insecutor Inscitiae Menstruus 4: 138.

Type-species: *Townsendiella pulchra* Crawford. Monotypic.

**pulchra** Crawford. N. Mex., south. Calif.; Mexico (Baja California).

*Townsendiella pulchra* Crawford, 1916. Insecutor Inscitiae Menstruus 4: 138. ♀.

#### Genus TOWNSENDIELLA Subgenus XEROPASITES Linsley

*Townsendiella* subg. *Xeropasites* Linsley, 1942. Pan-Pacific Ent. 18: 130.

Type-species: *Townsendiella (Xeropasites) rufiventris* Linsley. Monotypic and orig. desig.

**rufiventris** Linsley. South. Calif.

*Townsendiella (Xeropasites) rufiventris* Linsley, 1942. Pan-Pacific Ent. 18: 130. ♀, ♂.

#### Genus TOWNSENDIELLA Subgenus EREMOPASITES Linsley

*Townsendiella* subg. *Eremopasites* Linsley, 1942. Pan-Pacific Ent. 18: 131.

Type-species: *Townsendiella californica* Michener. Monotypic and orig. desig.

**californica** Michener. South. Calif. Host: *Hesperapis rufipes* (Ashm.).

*Townsendiella californica* Michener, 1936. Ent. News 47: 181. ♀, ♂.

#### TRIBE NEOLARRINI

This tribe contains only the Nearctic genus *Neolarra* whose species are parasitic in the nests of the andrenid genus *Perdita* and possibly also *Nomadopsis*.

Taxonomy: Rozen, 1966. Amer. Mus. Novitates 2244: 36-37, figs. 79-83 (larva).

## Genus NEOLARRA Ashmead

Revision: Michener, 1939. Amer. Ent. Soc., Trans. 65: 347-362.

## Genus NEOLARRA Subgenus NEOLARRA Ashmead

*Neolarra* Ashmead, 1890. Colo. Biol. Assoc., Bul. 1: 8.Type-species: *Neolarra pruinosa* Ashmead. Monotypic.**abdominalis** Michener. Mont.*Neolarra (Neolarra) abdominalis* Michener, 1939. Amer. Ent. Soc., Trans. 65: 352. ♀, ♂.**alba** Cockerell. South. Calif.*Neolarra alba* Cockerell, 1916. Ann. and Mag. Nat. Hist. (8) 17: 285. ♂.**californica** Michener. South. Calif.*Neolarra (Neolarra) californica* Michener, 1939. Amer. Ent. Soc., Trans. 65: 356. ♀, ♂.**congregata** Crawford. Tex., N. Mex.*Neolarra congregata* Crawford, 1907. N. Y. Ent. Soc., Jour. 15: 181. ♀, ♂.**helianthi** Cockerell. Colo.*Neolarra congregata helianthi* Cockerell, 1936. Amer. Mus. Novitates 831: 5. ♂.**linsleyi** Michener. South. Calif.*Neolarra (Neolarra) linsleyi* Michener, 1939. Amer. Ent. Soc., Trans. 65: 357. ♀, ♂.**pruinosa** Ashmead. Alta. to Colo., N. Mex. and Calif. Host: *Perdita (Cockerellula) opuntiae* Ckll., *P. (Perdita) zebata zebata* Cress.*Neolarra pruinosa* Ashmead, 1890. Colo. Biol. Assoc., Bul. 1: 8. ♀.*Neolarra vittata* Cockerell, 1916. Ann. and Mag. Nat. Hist. (8) 17: 285. ♂.

Taxonomy: Baker, 1896. Ent. Soc. Wash., Proc. 4: 23. ♀, ♂. —Rozen, 1966. Amer. Mus. Novitates 2244: 36-37 (larva).

Biology: Rozen, 1965. N. Y. Ent. Soc., Jour. 73: 87-88 (adult activity, host).

**vandykei** Michener. Calif. (Oakley).*Neolarra (Neolarra) vandykei* Michener, 1939. Amer. Ent. Soc., Trans. 65: 353. ♀, ♂.**verbesinae** (Cockerell). Nebr. to N. Mex.*Phileremus verbesinae* Cockerell, 1895. Psyche 7 (sup.): 10. ♀, ♂.

## Genus NEOLARRA Subgenus PHILEREMULUS Cockerell

*Phileremulus* Cockerell, 1895. Psyche 7 (sup.): 9.Type-species: *Phileremulus vigilans* Cockerell. Monotypic and orig. desig.**cockerelli** (Crawford). Tex., Tenn., Ga. Host: *Perdita (Alloperdita) obscurata* Cress.?*Phileremulus cockerelli* Crawford, 1916. Insecutor Inscitiae Menstruus 4: 139. ♀.

Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 490 (redescription, possible parasite).

**coloradensis** Michener. Colo.*Neolarra (Phileremulus) coloradensis* Michener, 1939. Amer. Ent. Soc., Trans. 65: 352. ♀, ♂.**mallochi** (Crawford). Alta.*Phileremulus mallochi* Crawford, 1912. Canad. Ent. 44: 359. ♂.**vigilans** (Cockerell). N. Mex., south. Calif. Host: *Perdita (Perdita) indioensis* Timb.*Phileremulus vigilans* Cockerell, 1895. Psyche 7 (sup.): 9. ♂, ♀.*Phileremulus nanus* Cockerell, 1895. Psyche 7 (sup.): 9. ♀.

## TRIBE HOLCOPASITINI

This tribe contains only two genera, *Holcopasites* from the Nearctic Region and *Schmiedeknechtia* of the Palearctic Region.

Taxonomy: Rozen, 1966. Amer. Mus. Novitates 2244: 30-33, figs. 66-71 (larva).



Genus **HOLCOPASITES** Ashmead

Insofar as known the species of this genus are cleptoparasites in the nests of pollen-collecting bees belonging to the subfamily Panurginae of the family Andrenidae. Although a definite host association has been established with the genera *Calliopsis*, *Heterosarus*, *Hypomacrotera*, *Pseudopanurgus* and *Pterosarus*, thus far none of the other genera of the formerly recognized tribe Panurgini (*Nomadopsis*, *Panurginus*, *Perdita*, *Protandrena*, etc.) which occur within the geographic range of *Holcopasites* has been implicated as a possible host.

Revision: Linsley, 1943. Amer. Ent. Soc., Trans. 69: 119 (as *Neopasites*). —Hurd and Linsley, 1972. Smithsn. Contrib. Zool. 114: 1-41, 16 figs., 1 table (Nearctic spp., including biology).

Taxonomy: Rozen, 1966. Amer. Mus. Novitates 2244: 30-33, figs. 66-71 (larva).

Biology: Rozen, 1965. N. Y. Ent. Soc., Jour. 73: 88-91, figs. 1-4 (life history). —Shinn, 1967. Kans. Univ. Sci. Bul. 46: 928-932. —Hurd and Linsley, 1972. Smithsn. Contrib. Zool. 114: 2, table 1 (host associations, summary of literature).

Genus **HOLCOPASITES** Subgenus **TRICHOPASITES** Linsley

*Neopasites* subg. *Trichopasites* Linsley, 1942. Pan-Pacific Ent. 18: 127.

Type-species: *Neopasites (Trichopasites) insoletus* Linsley. Monotypic and orig. desig.

*Neopasites* subg. *Odontopasites* Linsley, 1942. Pan-Pacific Ent. 18: 128.

Type-species: *Neopasites (Odontopasites) arizonicus* Linsley. Monotypic and orig. desig.

**arizonicus** (Linsley). Idaho, Utah, Colo., Ariz., N. Mex., south into Mexico (Baja California and Zacatecas). Host: *Calliopsis coloradensis* Cress., *C. pectidis* Shinn?, *Pterosarus occidus* (Timb.)?, *P. timberlakei* Ckll.?

*Neopasites (Odontopasites) arizonicus* Linsley, 1942. Pan-Pacific Ent. 18: 129. ♀, ♂.

**insoletus** (Linsley). Ariz., N. Mex. Host: *Pterosarus boylei* (Ckll.)?, *P. perlaevis* (Ckll.)?, *P. timberlakei* (Ckll.)?

*Neopasites (Trichopasites) insoletus* Linsley, 1942. Pan-Pacific Ent. 18: 128. ♀.

**rozeni** Hurd and Linsley. Ariz.; Mexico (Sinaloa and Sonora).

*Holcopasites (Trichopasites) rozeni* Hurd and Linsley, 1972. Smithsn. Contrib. Zool. 114: 10. ♀, ♂.

Genus **HOLCOPASITES** Subgenus **HOLCOPASITES** Ashmead

*Holcopasites* Ashmead, 1899. Amer. Ent. Soc., Trans. 26: 82.

Type-species: *Phileremus illinoiensis* Robertson. Desig. by Crawford, 1915.

## SPOTTED SPECIES GROUP

**apacheorum** Hurd and Linsley. Ariz., N. Mex.

*Holcopasites (Holcopasites) apacheorum* Hurd and Linsley, 1972. Smithsn. Contrib. Zool. 114: 14. ♀.

**bohartorum** Hurd and Linsley. Ariz., Calif. (Blythe).

*Holcopasites (Holcopasites) bohartorum* Hurd and Linsley, 1972. Smithsn. Contrib. Zool. 114: 18, fig. 8. ♀, ♂.

**calliopsidis calliopsidis** (Linsley). Mont. to N. Y., south to Tenn., Tex. and Ariz.; Mexico (Zacatecas). Host: *Calliopsis andreniformis* Sm., *Pseudopanurgus* sp.?

*Neopasites calliopsidis* Linsley, 1943. Amer. Ent. Soc., Trans. 69: 137. ♀, ♂.

*Holcopasites pseudocarinatus* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 489. ♀.

Biology: Ainslie, 1937. Canad. Ent. 69: 99 (as *stevensi*). —Shinn, 1967. Kans. Univ. Sci. Bul. 46: 928-932 (life history).

**calliopsidis carinatus** (Linsley). South. Tex.; Mexico (Hidalgo, San Luis Potosi and Veracruz).

*Neopasites carinatus* Linsley, 1943. Amer. Ent. Soc., Trans. 69: 127. ♀.

- heliopsis** (Robertson). Alta., Mont., Colo. and Ill., south to Ark. and Kans. Host: *Calliopsis nebraskensis* Cwfd.?  
*Ammobates heliopsis* Robertson, 1897. Acad. Sci. St. Louis, Trans. 7: 350. ♂.  
*Holcopasites lutzi* Cockerell, 1934. Amer. Mus. Novitates 697: 12. ♂.
- pulchellus** (Cresson). Alta., Sask. to N. Dak., south to Tex., N. Mex. and Ariz.; Mexico (Durango, Michoacan and Zacatecas). Host: *Pseudopanurgus* sp.?  
*Phileremus pulchellus* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 84. ♀, ♂.  
*Neopasites robertsoni* Crawford, 1906. Canad. Ent. 38: 283. ♀, ♂.  
*Neopasites robertsoni pubescens* Linsley, 1943. Amer. Ent. Soc., Trans. 69: 131. ♂.
- tegularis** Hurd and Linsley. Ariz. Host: *Heterosarus nanulus* (Timb.).  
*Holcopasites (Holcopasites) tegularis* Hurd and Linsley, 1972. Smithsn. Contrib. Zool. 114: 24. ♀, ♂.

## BANDIED SPECIES GROUP

- bigibbosus** Hurd and Linsley. Ariz. (Willcox); N. Mex. (Rodeo).  
*Holcopasites (Holcopasites) bigibbosus* Hurd and Linsley, 1972. Smithsn. Contrib. Zool. 114: 28, fig. 1, 14. ♀, ♂.
- cazieri** Hurd and Linsley. Ariz., N. Mex.  
*Holcopasites (Holcopasites) cazieri* Hurd and Linsley, 1972. Smithsn. Contrib. Zool. 114: 29, figs. 4, 16. ♀, ♂.
- eamia** (Cockerell). Tex., Okla.  
*Neopasites eamia* Cockerell, 1909. Ann. and Mag. Nat. Hist. (8) 4: 29. ♂.  
*Holcopasites acanthochilus* Crawford, 1915. Insecutor Inscitiae Menstruus 3: 125. ♀.  
*Holcopasites texanus* Crawford, 1915. Insecutor Inscitiae Menstruus 3: 126. ♂.
- haematurus** Cockerell and Hicks. Iowa, Nebr., Kans., Colo.  
*Holcopasites haematurus* Cockerell and Hicks, 1926. Ent. News 37: 107. ♂.
- illinoiensis illinoiensis** (Robertson). Ill. to Mass., south to Ga., La. and Tex. Host: *Calliopsis andreniformis* Sm.  
*Phileremus illinoiensis* Robertson, 1891. Amer. Ent. Soc., Trans. 18: 64. ♀.  
*Holcopasites pratti* Ashmead In Crawford, 1915. Insecutor Inscitiae Menstruus 3: 123. ♀.  
*Neopasites punctulatus* Linsley, 1943. Amer. Ent. Soc., Trans. 69: 135. ♂.
- illinoiensis minimus** (Linsley). Ariz., N. Mex.; Mexico (Sonora). Host: *Hypomacrotera callops persimilis* Ckll., *H. callops callops* Ckll.?  
*Neopasites minimus* Linsley, 1943. Amer. Ent. Soc., Trans. 69: 126. ♀.
- stevensi** Crawford. Alta., N. Dak., Nebr., Tex., N. Mex., Ariz. Host: *Calliopsis crypta* Shinn, *C. rozeni* Shinn?  
*Holcopasites stevensi* Crawford, 1915. Insecutor Inscitiae Menstruus 3: 125. ♀, ♂.  
*Neopasites elegans* Linsley, 1944. N. Y. Ent. Soc., Jour. 52: 277. ♀.  
*Neopasites knulli* Linsley, 1944. N. Y. Ent. Soc., Jour. 52: 278. ♀.

## TRIBE AMMOBATINI

Although this tribe is represented in the Palaearctic and Ethiopian regions by several genera, only the Nearctic genus *Oreopasites* is present in the New World and its species are apparently all cleptoparasitic in the nests of the andrenid genera *Nomadopsis* and *Hypomacrotera*.

Taxonomy: Rozen, 1966. Amer. Mus. Novitates 2244: 28-30, figs. 56-60 (larvae). — Rozen, 1974. Amer. Mus. Novitates 2551: 1-16, 33 figs. (larvae, pupae).

## Genus OREOPASITES Cockerell

*Oreopasites* Cockerell, 1906. Amer. Mus. Nat. Hist., Bul. 22: 442.

Type-species: *Oreopasites scituli* Cockerell. Monotypic.

Revision: Linsley, 1941. Amer. Ent. Soc., Trans. 66: 307.

Taxonomy: Rozen, 1954. Pan-Pacific Ent. 30: 203-207, 6 figs. (larva). — Rozen, 1966. Amer. Mus. Novitates 2244: 28-30, figs. 56-58. — Rozen, 1974. Amer. Mus. Novitates 2551: 12-15, figs. 26-28 (larvae, pupae).

**albinota** Linsley. Calif.

*Oreopasites albinota* Linsley, 1941. Amer. Ent. Soc., Trans. 66: 313. ♀.

**arizonica** Linsley. Ariz.

*Oreopasites arizonica* Linsley, 1941. Amer. Ent. Soc., Trans. 66: 310. ♀.

**euphorbiae** Cockerell. South. Calif. Host: *Nomadopsis euphorbiae* (Ckll.).

*Oreopasites euphorbiae* Cockerell, 1929. Pan-Pacific Ent. 5: 105. ♀, ♂.

**scituli** Cockerell. Colo. Host: *Nomadopsis scitula* (Cress.).

*Oreopasites scituli* Cockerell, 1906. Amer. Mus. Nat. Hist., Bul. 22: 442. ♀, ♂.

**vanduzeei diabloensis** Linsley. North. Calif. Host: *Nomadopsis* sp.

*Oreopasites vanduzeei diabloensis* Linsley, 1941. Amer. Ent. Soc., Trans. 66: 315. ♀, ♂.

**vanduzeei melanantha** Linsley. North. Calif. (Sierra Nevada). Host: *Nomadopsis anthidia* (Fowler).

*Oreopasites vanduzeei melanantha* Linsley, 1941. Amer. Ent. Soc., Trans. 66: 316. ♀, ♂.

**vanduzeei vanduzeei** Cockerell. North. Calif. (Cent. Valley). Host: *Nomadopsis equina* (Ckll.).

*Oreopasites vanduzeei* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 202. ♀.

**vanduzeei vernalis** Linsley. South Calif. Host: *Nomadopsis* sp.

*Oreopasites vanduzeei vernalis* Linsley, 1941. Amer. Ent. Soc., Trans. 66: 317. ♀, ♂.

**vanduzeei xerophila** Linsley. Ariz., South. Calif. (deserts). Host: *Nomadopsis puellae* (Ckll.).

*Oreopasites vanduzeei xerophila* Linsley, 1941. Amer. Ent. Soc., Trans. 66: 318. ♀, ♂.

## TRIBE PROTEPEOLINI

This is a small group found only in the Americas. In addition to the genus *Protepeolus* it contains *Isepeolus* and possibly one other Neotropical genus.

Taxonomy: Rozen, 1966. Amer. Mus. Novitates 2244: 10-12, figs. 2-7 (larva).

## Genus PROTEPEOLUS Linsley and Michener

*Protepeolus* Linsley and Michener, 1937. Pan-Pacific Ent. 13: 75.

Type-species: *Protepeolus singularis* Linsley and Michener. Monotypic and orig. desig.

**integer** Linsley. South Calif. to west. Tex.; Mexico (Durango and Jalisco). Host: *Diadasia ochracea* (Ckll.)?

*Protepeolus integer* Linsley, 1939. Pan-Pacific Ent. 15: 4. ♂.

Taxonomy: Hurd and Linsley, 1963. Kans. Ent. Soc., Jour. 36: 253-255. ♂, ♀ (possible parasite).

**singularis** Linsley and Michener. N. Mex. Host: *Diadasia ochracea* (Ckll.).

*Protepeolus singularis* Linsley and Michener, 1937. Pan-Pacific Ent. 13: 76. ♀.

Biology: Eickwort, Eickwort and Linsley, 1977. Kans. Ent. Soc., Jour. 50: 2, 9 (host, as *Diadasia olivacea*).

## TRIBE EPEOLOIDINI

Although there is a South American species attributed to the genus *Epeoloides*, the tribe is apparently represented only in the Holarctic Region by the genus *Epeoloides*. It is believed that the species are cleptoparasitic in the nests of the melittid genus *Macropis*.

## Genus EPEOLOIDES Giraud

*Epeoloides* Giraud, 1863. Zool.-Bot. Gesell. Wien., Verh. 13: 45.

Type-species: *Apis coecutiens* Fabricius. Monotypic. (= *Epeoloides ambiguus* Giraud).

*Viereckella* Swenk, 1907. Ent. News 18: 298.

Type-species: *Viereckella obscura* Swenk. Orig. desig.

**obscura** (Swenk). Nebr.

*Viereckella obscura* Swenk, 1907. Ent. News 18: 299. ♀.

**pilosula** (Cresson). Canada (Cap. Rouge), New England to Ga., west to Wis. and N. Dak.

*Nomada pilosula* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 77. ♂.

*Nomia compacta* Provancher, 1888. Addit. Corr. Faune Ent. Canada, Hym., p. 337. ♂.

*Epeolus pilosulus* Provancher, 1888. Addit. Corr. Faune Ent. Canada, Hym., p. 426. ♀.

*Viereckella ceanothina* Cockerell, 1907. Ent. News 18: 300. ♀.

*Epeoloides nearcticus* Ducke, 1909. Rev. Ent. Caen 27: 39. ♀.

Taxonomy: Crawford, 1917. Ent. Soc. Wash., Proc. 19: 167. — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 491-492, figs. 115, 116 (redescription, synonymy).

#### TRIBE EPEOLINI

The members of this tribe share many features with the Nomadini and perhaps, as has been suggested, they should be placed together in the Nomadini. With the exception of the primarily Holarctic genus *Epeolus* and a few Old World species of the predominantly New World genus *Triepeolus*, the epeoline bees are centered in the Americas and are especially well represented in the Neotropical Region by several genera. Only the genera *Epeolus* and *Triepeolus* are present in America north of Mexico, but it appears that a few of our species belong to the genus *Trophocleptia*.

Taxonomy: Rozen, 1966. Amer. Mus. Novitates 2244: 12-22, figs. 8-38 (larva).

#### Genus EPEOLUS Latreille

*Epeolus* Latreille, 1802. Hist. Nat. Fourmis, p. 427.

Type-species: *Apis variegata* Linnaeus. Monotypic. (= *Nomada variegata* Fabricius).

*Pyrrhomelecta* Ashmead, 1899. Amer. Ent. Soc., Trans. 26: 66.

Type-species: *Epeolus glabratus* Cresson. Monotypic and orig. desig.

*Argyroselenis* Robertson, 1903. Canad. Ent. 35: 284.

Type-species: *Triepeolus minimus* Robertson. Monotypic and orig. desig.

Insofar as known, the species of this chiefly Holarctic genus are cleptoparasitic in the nests of the genus *Colletes*.

Taxonomy: Cockerell, 1928. Colo. Univ., Studies 16: 105 (key). — Michener, 1953. Kans. Univ.

Sci. Bul. 35: 1072, figs. 195, 196, 198 (larva). — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech.

Bul. 152: 438-458, figs. 108-110 (eastern U. S. spp.). — Rozen, 1966. Amer. Mus. Novitates

2244: 19-20, figs. 25-32 (larva).

**ainsliei** Crawford. Iowa.

*Epeolus ainsliei* Crawford, 1932. Ent. Soc. Wash., Proc. 34: 74. ♀.

**americanus** (Cresson). Canada; Colo., Calif.

*Phileremus americanus* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 83. ♂, ♀.

Taxonomy: Cockerell, 1904. Ann. and Mag. Nat. Hist. (7) 13: 33. — Linsley, 1939. Pan-Pacific Ent. 15: 1.

**arciferus** Cockerell. Calif.

*Epeolus arciferus* Cockerell, 1924. Calif. Acad. Sci., Proc. (4) 13: 319. ♀.

**asperatus** Cockerell. Calif.

*Epeolus asperatus* Cockerell, 1909. Ann. and Mag. Nat. Hist. (8) 5: 25. ♀.

Taxonomy: Cockerell, 1934. Amer. Mus. Novitates 697: 12. ♀.

**australis** Mitchell. N. C., Ga.

*Epeolus australis* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 441, fig. 110. ♀, ♂.

**autumnalis** Robertson. Minn. to Maine, south to N. C. Host: *Colletes compactus* Cress.?

*Epeolus autumnalis* Robertson, 1902. Ent. News 13: 81. ♀.

Taxonomy: Robertson, 1903. Canad. Ent. 35: 287, 288. ♀.

**banksi** (Cockerell). Minn. to N. J. and N. C.

*Triepeolus banksi* Cockerell, 1907. Entomologist 40: 135. ♂.

**barberiellus** Cockerell. N. Mex.

*Epeolus barberiellus* Cockerell, 1907. Entomologist 40: 266. ♀.

**beulahensis** Cockerell. N. Mex., Colo., Iowa.

*Epeolus beulahensis* Cockerell, 1904. Ann. and Mag. Nat. Hist. (7) 13: 40. ♀.

**bifasciatus bifasciatus** Cresson. New England to Fla., west to Minn., Colo., Tex.; Mexico (northern). Host: *Colletes latitarsis* Robertson? Another subspecies occurs in Mexico and Panama.

*Epeolus bifasciatus* Cresson, 1864. Ent. Soc. Phila., Proc. 3: 38. ♂.

Taxonomy: Robertson, 1903. Canad. Ent. 33: 287, 288. ♀, ♂ (key).

**canadensis** Mitchell. N. S., Que., N. Y., Ont., Mich., Ind.

*Epeolus canadensis* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 444, fig. 110. ♀, ♂.

**carolinus** Mitchell. N. C., Fla.

*Epeolus carolinus* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 445, fig. 110. ♀, ♂.

**compactus** Cresson. Tex. to Colo., Nev., Calif.

*Epeolus compactus* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 89. ♀, ♂.

Taxonomy: Brues, 1903. Ent. News 14: 79 (key).

**crucis** Cockerell. N. Mex.

*Epeolus crucis* Cockerell, 1904. Ann. and Mag. Nat. Hist. (7) 13: 39. ♀.

**eastwoodae** Cockerell. Calif. (San Miguel Isl.).

*Epeolus eastwoodae* Cockerell, 1937. Pan-Pacific Ent. 13: 149. ♂.

**erigeronis** Mitchell. N. C., Ga., Fla.

*Epeolus erigeronis* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 445, fig. 110. ♀, ♂.

**floridensis** Mitchell. Fla.

*Epeolus floridensis* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 446, fig. 110. ♀, ♂.

**fumipennis** Say. Tex., north. Mex.

*Epeolus fumipennis* Say, 1837. Boston Jour. Nat. Hist. 1: 403.

**gabrielis** Cockerell. Calif.

*Epeolus gabrielis* Cockerell, 1909. Ann. and Mag. Nat. Hist. (8) 5: 26. ♂.

*Epeolus geminatus* Cockerell and Sandhouse, 1924. Calif. Acad. Sci., Proc. (4) 13: 315. ♀, ♂.

**glabratus** Cresson. Ga., Fla.

*Epeolus glabratus* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 90. ♂.

**hitei** Cockerell. Colo.

*Epeolus hitei* Cockerell, 1908. Entomologist 41: 60. ♀.

**howardi** Mitchell. N. C. (Southern Pines). Host: *Colletes howardi* Sw.?

*Epeolus howardi* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 447, fig. 110. ♀, ♂.

**humillimus** Cockerell. Wash., Oreg.

*Epeolus humillimus* Cockerell, 1918. Ann. and Mag. Nat. Hist. 9: 160. ♂.

**ilicis** Mitchell. R. I. and Mass. to Ga., Tenn.

*Epeolus ilicis* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 448, fig. 110. ♀, ♂.

**interruptus** Robertson. N. J. to Ga., west to Colo., Calif. and Tex. Host: *Colletes aestivalis* Patton?

*Epeolus interruptus* Robertson, 1900. Acad. Sci. St. Louis, Trans. 10: 55. ♀.

Taxonomy: Robertson, 1903. Canad. Ent. 33: 287, 288. ♀, ♂ (key).

**lanhami** Mitchell. Maine, Pa., Mich.

*Epeolus lanhami* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 450, fig. 110. ♀, ♂.

**lectiformis** Cockerell. Colo.

*Epeolus lectiformis* Cockerell, 1925. Ann. and Mag. Nat. Hist. (9) 16: 623. ♀.

**lectoides** Robertson. Ill. to New England, south to Ga.

*Epeolus lectoides* Robertson, 1901. Canad. Ent. 33: 231. ♀.

*Epeolus semilectus* Cockerell, 1907. Entomologist 40: 136. ♂.

Taxonomy: Robertson, 1903. Canad. Ent. 35: 287, 288. ♀, ♂ (key).

**lectus** Cresson. Kans., S. Dak.

*Epeolus lectus* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 88. ♀.

- Epeolus agnathus* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 89. ♂.  
*lutzi* Cockerell. Colo., Utah, Alta.  
*Epeolus lutzi* Cockerell, 1921. Amer. Mus. Novitates 23: 16. ♂, ♀.  
*Epeolus lutzi dimissus* Cockerell, 1921. Amer. Mus. Novitates 23: 16. ♀.  
**melectimimus** Cockerell and Sandhouse. Calif.  
*Epeolus melectimimus* Cockerell and Sandhouse, 1924. Calif. Acad. Sci., Proc. (4) 13: 317. ♂.  
**mercatus** Fabricius. "Carolina."  
*Epeolus mercatus* Fabricius, 1804. Systema Piezatorum, p. 389.  
**mesillae mesillae** (Cockerell). N. Mex. to south. Calif. Host: *Colletes clypeonitens* Swenk?  
*Phileremus mesillae* Cockerell, 1895. Psyche 7 (sup.): 10. ♂.  
 Taxonomy: Cockerell, 1904. Ann. and Mag. Nat. Hist. (7) 13: 42. ♀. — Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193:40 (*Larrea* visitation).  
**mesillae palmarum** Linsley. South. Calif. Host: *Colletes clypeonitens* Swenk?  
*Epeolus mesillae palmarum* Linsley, 1939. Pan-Pacific Ent. 15: 2. ♀.  
**minimus** (Robertson). Ill., Mich., Wis., west to Colo. and Calif. Host: *Colletes eulophi* Robertson.  
*Triepeolus minimus* Robertson, 1902. Ent. News 13: 81.  
 Biology: Graenicher, 1906. Wis. Nat. Hist. Soc., Bul. 4: 135.  
**montanus** (Cresson). Nev.  
*Phileremus montanus* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 83. ♂.  
**novomexicanus** Cockerell. N. Mex.  
*Epeolus novomexicanus* Cockerell, 1912. Ann. and Mag. Nat. Hist. (8) 10: 487. ♂.  
**olympiellus** Cockerell. Wash.  
*Epeolus olympiellus* Cockerell, 1904. Ann. and Mag. Nat. Hist. (7) 13: 41. ♂.  
**oswegoensis** Mitchell. N. Y. (Oswego).  
*Epeolus oswegoensis* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 453. ♂.  
**pilatei** Cockerell. Calif.  
*Epeolus pilatei* Cockerell, 1924. Calif. Acad. Sci., Proc. (4) 13: 320. ♀.  
**piscatoris** Cockerell. South. Calif. Is.  
*Epeolus piscatoris* Cockerell, 1939. Calif. Acad. Sci., Proc. (4) 23: 432. ♀.  
**pusillus** Cresson. Maine to Fla., west to Tex., Calif., Utah, Colo. and Wyo. Host: *Colletes americanus* Cresson?, *C. ciliatoides* Stephen, *C. compactus compactus* Cress., *C. deserticola* Timb.  
*Epeolus pusillus* Cresson, 1864. Ent. Soc. Phila., Proc. 2: 393. ♀.  
 Taxonomy: Robertson, 1903. Canad. Ent. 35: 287, 288. ♀, ♂ (key). — Brues, 1903. Ent. News 14: 80, 82 (key). — Rozen, 1966. Amer. Mus. Novitates 2244: 19-20, figs. 28-32 (larva).  
**rubrostrictus** Cockerell and Sandhouse. Calif.  
*Epeolus rubrostrictus* Cockerell and Sandhouse, 1924. Calif. Acad. Sci., Proc. (4) 13: 318. ♀.  
**rufomaculatus** Cockerell and Sandhouse. Calif., Utah, Colo.  
*Epeolus rufomaculatus* Cockerell and Sandhouse, 1924. Calif. Acad. Sci., Proc. (4) 13: 314. ♀, ♂.  
**rufulus** Cockerell. Colo.  
*Epeolus rufulus* Cockerell, 1941. Canad. Ent. 73: 36. ♀.  
**scelestus** Cresson. Tex.  
*Epeolus scelestus* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 86. ♀.  
*Epeolus scelestus* var. *tubercularis* Brues, 1903. Ent. News 14: 79. ♀.  
**scutellaris** Say. N. S. to N. C. and Fla., west to Minn. and Tex.  
*Epeolus scutellaris* Say, 1824. In Keating, Narr. Long's 2nd Exped., v. 2, p. 355. ♀.  
*Epeolus vernoniae* Cockerell, 1907. Entomologist 40: 136. ♂.  
 Taxonomy: Cresson, 1864. Ent. Soc. Phila., Proc. 2: 397. ♀. — Robertson, 1897. Acad. Sci. St. Louis, Trans. 7: 343. ♀, ♂.

**tricolor** Viereck. B. C.

*Epeolus tricolor* Viereck, 1905. Canad. Ent. 37: 280. ♀.

**vernalis** Mitchell. N. C. (Holly Shelter).

*Epeolus vernalis* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 455. ♀.

**weemsi** Mitchell. Fla. (Alachua Co.).

*Epeolus weemsi* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 455. ♂.

**zonatus** Smith. Fla.

*Epeolus zonatus* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 257. ♂, ♀.

Taxonomy: Cresson, 1864. Ent. Soc. Phila., Proc. 2: 397. ♀, ♂.

### Genus **TRIEPEOLUS** Robertson

*Triepeolus* Robertson, 1901. Canad. Ent. 33: 231.

Type-species: *Epeolus concavus* Cresson. Orig. design.

*Triepeolus* subg. *Synepeolus* Cockerell, 1921. Amer. Mus. Novitates 23: 6.

Type-species: *Triepeolus (Synepeolus) insolitus* Cockerell. Monotypic.

While most of the known host information suggests that these bees are cleptoparasites in the nests of eucerine bees (e.g., *Melissodes*, *Peponapis*, *Svastra*, and *Xenoglossa*), at least some species are known to be parasites of other Anthophoridae (e.g., *Anthophora*, *Centris*) as well as Colletidae (*Ptiloglossa*), Oxaeidae (*Protoxaea*) and Halictidae (*Nomia*).

Taxonomy: Cockerell, 1928. Colo. Univ., Studies 16: 107 (key). — Michener, 1953. Kans. Univ. Sci. Bul. 35: 1070, figs. 190-194, 197 (larva). — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 459-485, fig. 111 (eastern U. S. spp.). — Rozen, 1966. Amer. Mus. Novitates 2244: 12-19, figs. 15-24 (larva).

**agaricifer** Cockerell. N. Mex.

*Triepeolus agaricifer* Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 20: 60. ♂.

**alachuensis** Mitchell. Fla. (Alachua Co.).

*Triepeolus alachuensis* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 462. ♀.

**alpestris** Cockerell. Colo.

*Triepeolus alpestris* Cockerell, 1921. Amer. Mus. Novitates 21: 13. ♀.

**amandus** Cockerell. Colo.

*Triepeolus amandus* Cockerell, 1921. Amer. Mus. Novitates 23: 10. ♂.

**ancoratus** Cockerell. Calif.

*Triepeolus ancoratus* Cockerell, 1916. Pomona Jour. Ent. Zool. 8: 63. ♀.

**argyreus** (Cockerell). Wash., Oreg., Calif..

*Epeolus argyreus* Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 20: 60. ♂.

**balteatus** Cockerell. Colo.

*Triepeolus balteatus* Cockerell, 1921. Amer. Mus. Novitates 23: 5. ♂.

**bardus** (Cresson). Tex. to Minn. Host: *Nomia* sp.?

*Epeolus bardus* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 84. ♀.

Taxonomy: Brues, 1903. Ent. News 14: 80 (key). — Cockerell, 1935. Amer. Mus. Novitates 766: 7. ♀, ♂ (possible host).

**bihamatus** (Cockerell). Wash.

*Epeolus bihamatus* Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 20: 61. ♂.

**blaisdelli** Cockerell and Sandhouse. Calif. (Mokelumne).

*Triepeolus blaisdelli* Cockerell and Sandhouse, 1924. Calif. Acad. Sci., Proc. (4) 13: 310. ♂.

**brittaini** Cockerell. N. S.

*Triepeolus brittaini* Cockerell, 1931. Canad. Ent. 63: 297. ♂.

**brunnescens** Cockerell and Sandhouse. Calif.

*Triepeolus brunnescens* Cockerell and Sandhouse, 1924. Calif. Acad. Sci., Proc. (4) 13: 313. ♂.

**brunneus** Cockerell. Colo.

*Triepeolus brunneus* Cockerell, 1921. Amer. Mus. Novitates 23: 7. ♀.

**californicus** (Cresson). Calif.

*Epeolus californicus* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 86. ♀.

**callopus** Cockerell. Calif.

*Triepeolus callopus* Cockerell, 1905. Ann. and Mag. Nat. Hist. (7) 15: 202. ♀.

Taxonomy: Cockerell, 1916. Pomona Col. Jour. Ent. Zool. 8: 63-64. ♂, ♀.

**charlottensis** Mitchell. N. B. (Charlotte Co.).

*Triepeolus charlottensis* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 462, fig. 112. ♀.

**cirsianus** Mitchell. Ind. (Warren Co.).

*Triepeolus cirsianus* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 463. ♂.

**concaus** (Cresson). N. C. and Fla., west to Ill., Wis., Colo. and Calif. Host: *Svastra obliqua obliqua* (Say).

*Epeolus concaus* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 85. ♀.

Taxonomy: Brues, 1903. Ent. News 14: 81, fig. ♀, ♂. —Robertson, 1903. Canad. Ent. 33: 284, 285. ♀, ♂ (key). —Linsley and Michener, 1939. Amer. Ent. Soc., Trans. 65: pls. 15, 18.

Biology: Custer, 1928. Canad. Ent. 60: 28. —Custer, 1929. Psyche 36: 293.

**coquilletti** Cockerell. Calif., Miss.

*Triepeolus coquilletti* Cockerell, 1905. South. Calif. Acad. Sci., Bul. 4: 106. ♀.

**cressonii cressonii** (Robertson). Minn. to New England, south to Tenn. and N. C.

*Epeolus cressonii* Robertson, 1897. Acad. Sci. St. Louis, Trans. 7: 344. ♂, ♀.

**cressonii fraseriae** Cockerell. N. Mex.

*Triepeolus cressonii* var. *fraseriae* Cockerell, 1904. Ann. and Mag. Nat. Hist. (7) 13: 39. ♂.

**custeri** Cockerell. Colo.

*Triepeolus custeri* Cockerell, 1926. Ann. and Mag. Nat. Hist. (9) 17: 306. ♂.

**cyclurus** Cockerell. Colo.

*Triepeolus cyclurus* Cockerell, 1923. Ent. News 34: 49. ♀.

**dacotensis** (Stevens). N. Dak., Utah. Parasite: *Anthrax limatulus* Say.

*Epeolus dacotensis* Stevens, 1919. Canad. Ent. 51: 210. ♀, ♂.

Biology: Bohart, 1970. The Evolution of Parasitism among bees. Utah State Univ. Ann. Honor lecture p. 22, fig. 20, 22, 24, 27 (egg, larva, parasite).

**denverensis** Cockerell. Colo.

*Triepeolus denverensis* Cockerell, 1910. Entomologist, 43:91. ♂.

**dichropus** Cockerell. Colo.

*Triepeolus dichropus* Cockerell, 1921. Amer. Mus. Novitates 23: 11. ♂.

**distinctus** (Cresson). Ga., Fla.

*Epeolus distinctus* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 84. ♂, ♀.

**diversipes** Cockerell. Calif.

*Triepeolus diversipes* Cockerell, 1924. Calif. Acad. Sci., Proc. (4) 13: 314. ♂.

**donatus** (Smith). Wis. to New England and South. Canada, south to Ga. Host: *Melitoma taurea* Say.

*Epeolus donatus* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 256. ♀, ♂.

Taxonomy: Robertson, 1903. Canad. Ent. 35: 285, 286. ♀, ♂ (key).

Biology: Lutz and Cockerell, 1920. Amer. Mus. Nat. Hist., Bul. 42: 592 (host).

**eldoradensis** (Cockerell). Colo.

*Epeolus eldoradensis* Cockerell, 1910. Psyche 17: 245. ♂.

**eldredi** Cockerell. Wash., Utah, Wyo. Host: *Melissodes rustica* (Say).

*Triepeolus eldredi* Cockerell, 1907. Canad. Ent. 39: 52. ♂.

Biology: Clement, 1973. Kans. Ent. Soc., Jour. 46: 516-525 (host).

**floridanus** Mitchell. Fla. (Gainesville).

*Triepeolus floridanus* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 468. ♂.

**fortis** Cockerell. Colo., Calif.

*Triepeolus fortis* Cockerell, 1921. Amer. Mus. Novitates 23: 3. ♀, ♂.



**fraseri** Cockerell. N. Mex.

*Triepeolus fraseri* Cockerell, 1904. Ann. and Mag. Nat. Hist. (7) 13: 39. ♂.

Taxonomy: Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 20: 62. ♂ (key).

**georgicus** Mitchell. Ga. (Fort Gordon).

*Triepeolus georgicus* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 469, fig. 112. ♀.

**grindeliae** Cockerell. Colo.

*Triepeolus grindeliae* Cockerell, 1907. Canad. Ent. 39: 51. ♀.

**haematurus** Cockerell and Sandhouse. Utah.

*Triepeolus haematurus* Cockerell and Sandhouse, 1924. Calif. Acad. Sci., Proc. (4) 13: 311. ♀.

**helianthi arizonensis** Cockerell. Ariz.

*Triepeolus helianthi* var. *arizonensis* Cockerell, 1904. Ann. and Mag. Nat. Hist. (7) 13: 39. ♂.

**helianthi grandior** Cockerell. Colo., N. Mex.

*Triepeolus helianthi grandior* Cockerell, 1919. N. Y. Ent. Soc., Jour. 27: 300. ♀, ♂.

**helianthi helianthi** (Robertson). Ind., Ill., and Wis., west to Colo., Wyo. and Ariz. Host:

*Melissodes trinodis* Robt., *M. composita* Tucker?

*Epeolus helianthi* Robertson, 1897. Acad. Sci. St. Louis, Trans. 7: 344. ♀.

Taxonomy: Cockerell, 1921. Amer. Mus. Novitates 23: 3, 15 (key).

Biology: Graenicher, 1905. Wis. Nat. Hist. Soc., Bul. 3: 164-166, figs. —Hurd and Linsley, 1959. Ent. News 70: 141-146 (?host).

**helianthi pacificus** Cockerell. Colo.

*Triepeolus helianthi pacificus* Cockerell, 1919. N. Y. Ent. Soc., Jour. 27: 300. ♂.

Taxonomy: Cockerell, 1921. Amer. Mus. Novitates 23: 4, 15 (key).

**heterurus** (Cockerell and Sandhouse). Calif., Oreg.

*Epeolus heterurus* Cockerell and Sandhouse, 1924. Calif. Acad. Sci., Proc. (4) 13: 316. ♀, ♂.

**hopkinsi** Cockerell. Ariz.

*Triepeolus hopkinsi* Cockerell, 1905. Biol. Soc. Wash., Proc. 18: 184. ♂.

**insolitus** Cockerell. Colo.

*Triepeolus* (*Synepeolus*) *insolitus* Cockerell, 1921. Amer. Mus. Novitates 23: 6. ♂.

**inyoensis** Cockerell and Sandhouse. Calif.

*Triepeolus inyoensis* Cockerell and Sandhouse, 1924. Calif. Acad. Sci., Proc. 4 (13): 309. ♂.

**isocomae** Cockerell. N. Mex.

*Triepeolus isocomae* Cockerell, 1904. Ann. and Mag. Nat. Hist. (7) 13: 38. ♂.

**junctus** Mitchell. N. Y., N. C.

*Triepeolus junctus* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 471. ♀, ♂.

**laticaudus** Cockerell. Colo.

*Triepeolus laticaudus* Cockerell, 1921. Amer. Mus. Novitates 23: 12. ♀.

**lestes** Cockerell. Colo., Calif.

*Triepeolus lestes* Cockerell, 1921. Amer. Mus. Novitates 23: 11. ♀.

Taxonomy: Cockerell, 1929. Pan-Pacific Ent. 5: 102. ♀, ♂.

**lineatulus** Cockerell and Sandhouse. Calif., Ariz. Host: *Melissodes tepida timberlakei* Ckll.

*Triepeolus lineatulus* Cockerell and Sandhouse, 1924. Calif. Acad. Sci., Proc. (4) 13: 306. ♀, ♂.

**loganensis** Cockerell. Colo.

*Triepeolus loganensis* Cockerell, 1925. Ann. and Mag. Nat. Hist. (9) 16: 624. ♂.

**lunatus concolor** (Robertson). Minn. to Pa., south to Fla. and Tex. Host: *Melissodes bimaculata bimaculata* (LeP.).

*Epeolus lunatus* var. *concolor* Robertson, 1898. Acad. Sci. St. Louis, Trans. 8: 51.

Taxonomy: Robertson, 1903. Canad. Ent. 35: 285, 286. ♀, ♂ (key). —Cockerell, 1904. Ann. and Mag. Nat. Hist. (7) 13: 35. ♂ (key). —Cockerell, 1921. Amer. Mus. Novitates 23: 14 (key).

- lunatus lunatus** (Say). Minn. to New England, south to Fla., west to Tex., N. Mex. and Colo.  
*Epeolus lunatus* Say, 1824. In Keating, Narr. Long's 2nd Exped., v. 2, p. 354. ♀, ♂.  
 Taxonomy: Brues, 1903. Ent. News 14: 79, 80. ♀, ♂ (key). —Robertson, 1903. Canad. Ent. 35: 284, 286. ♀, ♂ (key). —Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 20: 62. ♂ (key).  
 —Cockerell, 1921. Amer. Mus. Novitates 23: 2, 14. (key).
- lutor** Cockerell. Colo.  
*Triepeolus lutor* Cockerell, 1925. Ann. and Mag. Nat. Hist. (9) 16: 625. ♂.
- maculiventris** Cockerell. Colo.  
*Triepeolus maculiventris* Cockerell, 1921. Amer. Mus. Novitates 23: 11. ♀.
- martini** (Cockerell). N. Mex., Colo.  
*Epeolus remigatus* var. *martini* Cockerell, 1900. Canad. Ent. 32: 362. ♂, ♀.  
 Taxonomy: Cockerell, 1904. Ann. and Mag. Nat. Hist. (7) 14: 24 (tax. status).
- mensae** Cockerell. Oreg.  
*Triepeolus mensae* Cockerell, 1924. Calif. Acad. Sci., Proc. (4) 13: 313. ♂.
- mesillae** Cockerell. Kans., N. Mex. Host: *Nomia triangulifera* Vachal.  
*Triepeolus mesillae* Cockerell, 1904. Ann. and Mag. Nat. Hist. (7) 13: 36. ♀.  
 Taxonomy: Rozen, 1966. Amer. Mus. Novitates 2244: 16-17, figs. 19-23 (larva).
- michiganensis** Mitchell. Conn., N. Y., Mich.  
*Triepeolus michiganensis* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 473. ♀, ♂.
- micropygius atripes** Mitchell. Pa., N. C., Ga.  
*Triepeolus micropygius atripes* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 474, fig. 112. ♀, ♂.
- micropygius micropygius** Robertson. Ill.  
*Triepeolus micropygius* Robertson, 1903. Canad. Ent. 35: 286. ♀.
- mitchelli** Hurd, n. name. N. C. (Marion).  
*Triepeolus sublunatus* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 483. ♂. Preocc.
- mojavensis** Linsley. Calif. Host: *Anthophora linsleyi* Timberlake.  
*Triepeolus mojavensis* Linsley, 1939. Pan-Pacific Ent. 15: 2. ♀.  
 Biology: Linsley and MacSwain, 1942. Amer. Midland Nat. 27: 409.
- monardae** Mitchell. N. C.  
*Triepeolus monardae* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 475, fig. 112. ♂.
- nevadensis** (Cresson). N. C. and Ga., west to Nebr., Tex., N. Mex. and Nev.  
*Epeolus nevadensis* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 86. ♀.  
 Taxonomy: Robertson, 1903. Canad. Ent. 35: 285, 286. ♀, ♂ (key).
- nigriceps** (Smith). Calif., Tex.  
*Epeolus nigriceps* Smith, 1879. Descr. New Species Hym. Brit. Mus., p. 103. ♀.
- nigrihirtus** Mitchell. N. C. (Chatham Co.).  
*Triepeolus nigrihirtus* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 476. ♂.
- norae** Cockerell. N. Mex.  
*Triepeolus norae* Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 20: 59. ♀.  
 Biology: Linsley, 1962. Ent. Soc. Amer., Ann. 55: 161.
- obliteratus** Graenicher. Wis.  
*Triepeolus obliteratus* Graenicher, 1911. Pub. Mus. City Milwaukee, Bul. 1: 242. ♀, ♂.
- occidentalis** (Cresson). Pacific Coast to Kans., N. Mex., Tex. Host: *Melissodes mizeae* Cockerell?  
*Epeolus occidentalis* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 87. ♂, ♀.  
 Taxonomy: Brues, 1903. Ent. News 14: 80 (key). —Cockerell, 1904. Ann. and Mag. Nat. Hist. (7) 13: 34, 35. ♀, ♂ (key).
- Biology: Hicks, 1926. Colo. Univ., Studies 15: 225.
- paenepectoralis** Viereck. B. C. to Wash., Colo.  
*Triepeolus paenepectoralis* Viereck, 1905. Canad. Ent. 37: 278. ♀.

- Taxonomy: Cockerell, 1921. Amer. Mus. Novitates 23: 15 (key).
- pallidiventris** Cockerell and Sandhouse. Utah.  
*Tripeolus pallidiventris* Cockerell and Sandhouse, 1924. Calif. Acad. Sci., Proc. (4) 13: 308. ♂.
- pectoralis** (Robertson). Maine to Ga., west to Minn., Colo. and Utah. Host: *Melissodes rustica* (Say)?  
*Epeolus pectoralis* Robertson, 1897. Acad. Sci. St. Louis, Trans. 7: 345. ♀.  
*Epeolus virginienensis* Cockerell, 1907. Entomologist 40: 137. ♂.
- Taxonomy: Robertson, 1903. Canad. Ent. 35: 285. ♀ (key). — Lovell and Cockerell, 1905. Psyche 12: 42. ♂.
- penicilliferus** (Brues). Tex.  
*Epeolus penicilliferus* Brues, 1903. Ent. News 14: 81. ♀, ♂.
- Taxonomy: Cockerell, 1904. Ann. and Mag. Nat. Hist. (7) 13: 34. ♀.
- perelegans** Cockerell. Ariz.  
*Tripeolus perelegans* Cockerell, 1921. Amer. Mus. Novitates 23: 8. ♂.
- permixtus** (Cockerell). Calif.; Mexico (Baja California).  
*Epeolus permixtus* Cockerell, 1923. Calif. Acad. Sci., Proc. (4) 12: 94. ♂, ♀.
- pimarum** Cockerell. Ariz.  
*Tripeolus pimarum* Cockerell, 1904. Ann. and Mag. Nat. Hist. (7) 13: 36. ♀.
- pomonalis** Cockerell. Calif.  
*Tripeolus pomonalis* Cockerell, 1916. Canad. Ent. 48: 392. ♂.
- quadrifasciatus atlanticus** Mitchell. Md. to Fla., Mo.  
*Tripeolus 4-fasciatus atlanticus* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 479, fig. 112. ♀, ♂.
- quadrifasciatus quadrifasciatus** (Say). Ark., Tex.  
*Epeolus 4-fasciatus* Say, 1823. West. Quart. Rptr. 2: 81.
- Taxonomy: Brues, 1903. Ent. News 14: 80 (key).
- rectangularis** Cockerell. Colo., Utah, Oreg., Calif.  
*Tripeolus rectangularis* Cockerell, 1921. Amer. Mus. Novitates 23: 9. ♂.
- remigatus** (Fabricius). N. J. to Fla., west to Minn., Colo. and Calif., south to Tex., N. Mex. and Ariz.; Mexico (northern). Host: *Peponapis pruinosa* (Say)?, *Xenoglossa strenua* (Cress.).  
*Melecta remigata* Fabricius, 1804. Systema Piezatorum, p. 387.
- Taxonomy: Cresson, 1864. Ent. Soc. Phila., Proc. 2: 293. ♀, ♂. — Brues, 1903. Ent. News 14: 79 (key). — Robertson, 1903. Canad. Ent. 35: 285, 286. ♀, ♂ (key). — Rozen, 1966. Amer. Mus. Novitates 2244: 17-19, fig. 24 (larva).
- Biology: Bohart, 1966. Pan-Pacific Ent. 42: 255-262 (life history, immature stages).
- rhododontus** Cockerell. Colo.  
*Tripeolus rhododontus* Cockerell, 1921. Amer. Mus. Novitates 23: 5. ♂.
- robustus** (Cresson). N. Mex.  
*Epeolus robustus* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 85. ♀.
- rohweri** Cockerell. Colo.  
*Tripeolus rohweri* Cockerell, 1911. Ann. and Mag. Nat. Hist. (8) 8: 668. ♂.
- rufithorax** Graenicher. Fla. Host: *Svastra obliqua obliqua* (Say).  
*Tripeolus rufithorax* Graenicher, 1928. Ent. News 39: 279. ♀, ♂.
- Biology: Rozen, 1964. Amer. Mus. Novitates 2170: 9.
- rugosus** Mitchell. Fla.  
*Tripeolus rugosus* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 482, fig. 112. ♀.
- sandhousei** Cockerell. Colo.  
*Tripeolus sandhousei* Cockerell, 1925. Ann. and Mag. Nat. Hist. (9) 16: 624. ♂.
- sarothrinus** (Cockerell). Calif.  
*Epeolus sarothrinus* Cockerell, 1929. Pan-Pacific Ent. 5: 103. ♀, ♂.  
*Epeolus sarothrinus* var. *confluens* Cockerell, 1929. Pan-Pacific Ent. 5: 104. ♂.

**saturninus** Cockerell and Sandhouse. Calif.

*Triepeolus saturninus* Cockerell and Sandhouse, 1924. Calif. Acad. Sci., Proc. (4) 13: 312. ♂.

**schwarzi** *schwarzi* Cockerell. Colo.

*Triepeolus schwarzi* Cockerell, 1921. Amer. Mus. Novitates 23: 4. ♂.

**schwarzi subcalens** Cockerell and Sandhouse. Calif.

*Triepeolus schwarzi subcalens* Cockerell and Sandhouse, 1924. Calif. Acad. Sci., Proc. (4) 13: 309. ♂, ♀.

**segregatus** (Cockerell). N. Mex.

*Epeolus occidentalis* var. *segregatus* Cockerell, 1900. Canad. Ent. 32: 361. ♂ (♀ misdet. ?).

Taxonomy: Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 20: 62. ♀, ♂ (key).

**sequior** Cockerell. Colo.

*Triepeolus sequior* Cockerell, 1921. Amer. Mus. Novitates 23: 8. ♂.

**simplex** Robertson. Wis., Ill. and Mich. south to N. C. and Ga.

*Triepeolus simplex* Robertson, 1903. Canad. Ent. 35: 285, 286. ♀, ♂.

**stricklandi** Cockerell. Alta.

*Triepeolus stricklandi* Cockerell, 1937. Canad. Ent. 69: 86. ♀.

**subalpinus** Cockerell. Colo.

*Triepeolus subalpinus* Cockerell, 1910. Psyche 17: 245. ♀.

**sublunatus** Cockerell. N. Mex.

*Triepeolus sublunatus* Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 20: 62. ♂.

**subnitens** Cockerell and Timberlake. Calif.

*Triepeolus subnitens* Cockerell and Timberlake, 1929. Pan-Pacific Ent. 5: 167. ♂, ♀.

**superbus** (Provancher). Calif.

*Epeolus superbus* Provancher, 1895. Nat. Canad. 22: 190.

**tanneri** Cockerell. Utah.

*Triepeolus tanneri* Cockerell, 1928. Psyche 35: 232. ♂.

**texanus nigripes** Cockerell. N. Mex.

*Triepeolus texanus* var. *nigripes* Cockerell, 1898. N. Mex. Univ., Bul. 1: 61. ♂.

**texanus texanus** (Cresson). Tex.

*Epeolus texanus* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 87. ♂.

Taxonomy: Cockerell, 1904. Ann. and Mag. Nat. Hist. (7) 13: 34. ♀ (key).

**timberlakei** Cockerell. Calif., Utah. Host: *Melissodes tepida timberlakei* Kkll.

*Triepeolus timberlakei* Cockerell, 1929. Pan-Pacific Ent. 5: 101. ♀, ♂.

*Triepeolus timberlakei* var. *heterodoxus* Cockerell, 1929. Pan-Pacific Ent. 5: 101. ♀.

**townsendi** Cockerell. N. Mex.

*Triepeolus townsendi* Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 20: 63. ♂, ♀.

**trichopygus** Cockerell and Timberlake. Calif.

*Triepeolus trichopygus* Cockerell and Timberlake, 1929. Pan-Pacific Ent. 5: 169. ♀, ♂.

**trilobatus** Cockerell. Colo.

*Triepeolus trilobatus* Cockerell, 1921. Amer. Mus. Novitates 23: 7. ♂.

**utahensis** (Cockerell). Utah.

*Epeolus utahensis* Cockerell, 1921. Amer. Mus. Novitates 23: 15. ♂.

**vandykei** Cockerell and Sandhouse. Calif.

*Triepeolus vandykei* Cockerell and Sandhouse, 1924. Calif. Acad. Sci., Proc. (4) 13: 307. ♀.

**verbesinae** (Cockerell). N. Mex. to Calif.; Mexico (Baja California).

*Epeolus verbesinae* Cockerell, 1897. Amer. Ent. Soc., Trans. 24: 156. ♂, ♀.

Taxonomy: Cockerell, 1904. Ann. and Mag. Nat. Hist. (7) 11: 60. ♂ (key).

Biology: Linsley, 1962. Ent. Soc. Amer., Ann. 55: 161.

**wyomingensis** Cockerell. Wyo. to Utah.

*Triepeolus wyomingensis* Cockerell, 1905. Ann. and Mag. Nat. Hist. (7) 15: 201. ♂.

## TRIBE NOMADINI

Although this tribe is represented in the Old World especially by numerous species of *Nomada*, it is chiefly an American group inhabiting both North and South America. In America north of Mexico there are nearly 300 species of *Nomada* as well as several small genera which are mostly centered in the more arid parts of the southwestern United States and adjacent Mexico. While there is some evidence to suggest that the members of this tribe and those of the tribe Epeolini be grouped together, these tribes are maintained as distinct in this catalog.

On the basis of our current knowledge concerning host relationships most of the species are cleptoparasites in the nests of the family Andrenidae, especially the genus *Andrena*, but some of the species (and even groups of species) also parasitize the nests of Halictidae, Melittidae, and Anthophoridae.

Taxonomy: Rozen, 1966. Amer. Mus. Novitates 2244: 22-28, figs. 39-55 (larvae).

Genus *NOMADA* Scopoli

The bees of this genus are wasp-like in appearance and are present on all the continents and many of the islands. The genus is represented in the Nearctic Region by numerous species of several subgenera. These bees are cleptoparasitic in the nests of other bees, principally the genus *Andrena*, but are also known to parasitize the nests of certain Halictidae, Melittidae and Anthophoridae. As with many cleptoparasitic bees, they are frequently encountered either flying about the nesting sites of their hosts or sipping nectar with them at the same flowers.

Taxonomy: Cresson, 1887. Amer. Ent. Soc., Trans., Sup. (2): 296-297. — Robertson, 1903. Canad. Ent. 35: 172-179. — Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 559-579, 580-610. — Cockerell, 1904 (1903). Colo. Expt. Sta., Rpt. of Ent., Bul. 94: 65-85. — Cockerell, 1905. Amer. Ent. Soc., Trans. 31: 309-312 (notes on British Museum types). — Cockerell, 1911. U. S. Natl. Mus., Proc. 41: 225-243. — Swenk, 1912. Nebr. Univ., Studies 2 (1): 1-113. — Rodeck, 1931. Amer. Mus. Novitates 496: 1-11. — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 338-437, figs. 98-107, tables 11-13 (eastern U. S. spp.).

Morphology: Cockerell and Atkins, 1902. Ann. and Mag. Nat. Hist. (7) 10: 40-44. — Beck, 1933. Utah Acad. Sci., Arts and Letters, Proc. 10: 101, figs. 60-64. — Linsley and Michener, 1939. Amer. Ent. Soc., Trans. 65: 265-305, 4 pls. — Snodgrass, 1941. Smithsn. Misc. Coll. 99: 55-56, pl. 27 F-J.

Genus *NOMADA* Subgenus *NOMADA* Scopoli

*Nomada* Scopoli, 1770. Historico Naturalis, Ann. 4: 44.

Type-species: *Nomada ruficornis* (Linnaeus). Desig. by Curtis, 1832.

Taxonomy: Robertson, 1903. Canad. Ent. 35: 174-175, 178-179. — Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 569-579, 589 (in part), etc. — Viereck *et al.*, 1905. Canad. Ent. 37: 285-287. — Swenk, 1913. Nebr. Univ., Studies 12: 10-11, 15-57. — Swenk, 1915. Nebr. Univ., Studies 15: 155-163. — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 402-436, figs. 106-107 (eastern U. S. spp.).

**accepta** Cresson. Colo., Kans.

*Nomada accepta* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 77. ♀, ♂.

*Nomada pacata* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 81. ♀.

**aldrichi** Cockerell. Idaho, Wash., B. C.

*Nomada vicinialis aldrichi* Cockerell, 1910. Ann. and Mag. Nat. Hist. (8) 5: 368. ♂.

**amoena** Cresson. Ill.

*Nomada amoena* Cresson, 1863. Ent. Soc. Phila., Proc. 2: 300. ♀.

**angelarum** Cockerell. Calif.

*Nomada (Nomada) angelarum* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 574. ♀.

**angulata** Swenk. Nebr.

*Nomada (Nomada) angulata* Swenk, 1913. Nebr. Univ., Studies 12: 40. ♀.

**aprilina** Swenk. Nebr.

*Nomada (Nomada) aprilina* Swenk, 1913. Nebr. Univ., Studies 12: 28. ♂.

- armatella** Cockerell. Mich. to New England.  
*Nomada armatella* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 606. ♂.
- astori** Cockerell. Oreg.  
*Nomada astori* Cockerell, 1903. Ann. and Mag. Nat. Hist. (7) 12: 206. ♀. Var. a = *mediana* Swenk.
- atrofrontata** Cockerell. South. Calif.  
*Nomada (Nomada) atrofrenata* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 573. ♀.
- augustiana** Mitchell. Ga. (Augusta).  
*Nomada augustiana* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 402. ♀.
- azaleae** Mitchell. N. C. (Highlands).  
*Nomada azaleae* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 403, fig. 107. ♂.
- banksi** Cockerell. Ont. and N. Y., south to Ill. and N. C.  
*Nomada banksi* Cockerell, 1907. Entomologist 40: 98. ♀.
- beulahensis** Cockerell. N. Mex., N. Dak.  
*Nomada beulahensis* Cockerell, 1903. Ann. and Mag. Nat. Hist. (7) 12: 209. ♀.
- bicrista** Swenk. Nebr.  
*Nomada (Nomada) bicrista* Swenk, 1913. Nebr. Univ., Studies 12: 27. ♂.
- bifurcata** Cockerell. Calif.  
*Nomada (Nomada) bifurcata* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 577. ♂.
- bisetosa** Swenk. Nebr.  
*Nomada (Nomada) bisetosa* Swenk, 1913. Nebr. Univ., Studies 12: 30. ♀.
- bisignata** Say. "United States."  
*Nomada bisignata* Say, 1824. In Keating, Narr. Long's 2nd Exped., v. 2, p. 354. ♀.  
*Nomada bicincta* (!) Howard, 1902. Insect Book, pl. 3, fig. 32.
- californiae** Cockerell. Calif.  
*Nomada (Nomada) californiae* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 571. ♀.
- capillata** Mitchell. Mass. (Milton).  
*Nomada capillata* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 406. ♂.
- carinicauda** Cockerell. Colo.  
*Nomada carinicauda* Cockerell, 1921. Amer. Mus. Novitates 24: 7. ♀.
- ceanothi** Cockerell. N. Y. to N. C.  
*Nomada (Nomada) ceanothi* Cockerell, 1907. Entomologist 40: 97. ♀.
- clarkii** Cockerell. Oreg.  
*Nomada Clarkii* Cockerell, 1903. Ann. and Mag. Nat. Hist. (7) 12: 203. ♀.
- coloradella** Cockerell. Colo.  
*Nomada coloradella* Cockerell, 1905. Colo. Agr. Expt. Sta., Bul. 94: 83. ♂, ♀.
- composita** Mitchell. Conn., Mich.  
*Nomada composita* Mitchell, 1962. N. C. Agr. Expt. Sta., Tech. Bul. 152: 408. ♀.
- cordleyi** Cockerell. Oreg.  
*Nomada Cordleyi* Cockerell, 1903. Ann. and Mag. Nat. Hist. (7) 12: 445. ♂.
- corvallisensis** Cockerell. Oreg.  
*Nomada corvallisensis* Cockerell, 1903. Ann. and Mag. Nat. Hist. (7) 12: 207. ♀.
- cressonii** cressonii Robertson. Colo., N. Dak. to N. S. south to Tenn. and N. C.  
*Nomada cressonii* Robertson, 1893. Amer. Ent. Soc., Trans. 20: 275. ♀, ♂.  
*Nomada mera* Cockerell, 1908. Ent. Soc. Wash., Proc. 10: 83. ♀.
- cressonii trevoriana** Cockerell. Wash.  
*Nomada (Nomada) Cressonii Trevoriana* Cockerell, 1905. Canad. Ent. 37: 285.
- crudelis** Cresson. Ga. Host: *Andrena obscuripennis* Sm?  
*Nomada crudelis* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 82. ♀.
- cymbalariae** Cockerell. Colo.  
*Nomada cymbalariae* Cockerell, 1906. Amer. Mus. Nat. Hist., Bul. 22: 439. ♀.
- davidsoni** Cockerell. Calif.  
*Nomada (Nomada) davidsoni* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 575. ♀.

**decepta** Mitchell. N. Y., Mich.

*Nomada decepta* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 411. ♀.

**denticulata** Robertson. Minn. to N. Y., south to Ga.

*Nomada denticulata* Robertson, 1902. Canad. Ent. 34: 49.

*Nomada simplex* Robertson, 1902. Ent. News 13: 80. ♂.

**depressa** Cresson. Nebr., Mich. to Maine, south to N. C.

*Nomada depressa* Cresson, 1863. Ent. Soc. Phila., Proc. 2: 302. ♀.

*Nomada depressicauda* Cockerell, 1908. Ent. News 19: 323. ♀.

**detrita** Mitchell. N. H. (Randolph).

*Nomada detrita* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 414, figs. 106, 107. ♂.

**dreisbachi** Mitchell. Maine, Mass., Mich.

*Nomada dreisbachi* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 414. ♂.

**elegantula** Cockerell. Calif., Idaho.

*Nomada (Nomada) elegantula* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 578. ♀.

**erythraea** Dalla Torre. Calif.

*Nomada rubra* Provancher, 1888. Addit. Corr. Faune Ent. Canada, Hym. p. 427. ♀. Preocc.

*Nomada erythraea* Dalla Torre, 1896. Cat. Hym., v. 10, p. 343. N. name.

**flammigera** Cockerell. Wash.

*Nomada (Nomada) flammigera* Cockerell, 1906. Ann. and Mag. Nat. Hist. (7) 18: 71. ♀.

**florilega** Lovell and Cockerell. Mich. to Maine, south to N. C.

*Nomada (Nomada) florilega* Lovell and Cockerell, 1905. Psyche 12: 41. ♀.

**fontis** Cockerell. Colo.

*Nomada (Nomada) fontis* Cockerell, 1910. Canad. Ent. 42: 367. ♀.

**gibbosa** Viereck. Oreg.

*Nomada gibbosa* Viereck, 1905. Canad. Ent. 37: 285. ♂.

**gracilis** Cresson. N. Y. and New England.

*Nomada gracilis* Cresson, 1863. Ent. Soc. Phila., Proc. 2: 295. ♂.

**hoodiana** Cockerell. Oreg.

*Nomada hoodiana* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 608. ♀.

**idahoensis** Swenk. Idaho.

*Nomada (Nomada) idahoensis* Swenk, 1913. Nebr. Univ., Studies 12: 53. ♂.

**illinoensis** Robertson. Minn. to Mass., south to Ga. Predator: *Pselliopus barberi* Davis.

*Nomada illinoensis* Robertson, 1900. Canad. Ent. 32: 294. ♀, ♂.

*Nomada illinoensis* Cockerell, 1911. U. S. Natl. Mus., Proc. 39: 657. Emend.

*Nomada illinoensis* Cockerell, 1921. Amer. Mus. Novitates 24: 7. ♀. Emend.; diaeresis placed over e in *illinoensis*.

Biology: Bouseman, 1976. Kans. Ent. Soc., Jour. 49: 384 (predator).

**indusata** Mitchell. N. C., Ga.

*Nomada indusata* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 418, fig. 107. ♂.

**inepta** Mitchell. Maine to N. C., Minn.

*Nomada inepta* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 419. ♀.

**interruptella** Fowler. Calif.

*Nomada interruptella* Fowler, 1899. Ent. News 10: 159. ♂. Preocc.

*Nomada interruptella* Fowler, 1902. Calif. Agr. Expt. Sta., Rpt., 1898-1901, p. 329. N. name.

**itamera** Cockerell. Wash.

*Nomada itamera* Cockerell, 1910. Psyche 17: 95. ♀.

**kincaidiana** Cockerell. Wash.

*Nomada kincaidiana* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 614. ♀.

**kingstonensis** Mitchell. R. I. (Kingston).

*Nomada kingstonensis* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 420. ♀.

**latifrons** Cockerell. Calif., Nev.

*Nomada (Nomada) latifrons* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 572. ♀.

**lehighensis** Cockerell. Mich. to N. S., south to Ga.

*Nomada lehighensis* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 605. ♀, ♂.

**lewisi** Cockerell. Oreg.

*Nomada Lewisi* Cockerell, 1903. Ann. and Mag. Nat. Hist. (7) 12: 205. ♀.

**libata** Cresson. Colo.

*Nomada libata* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 80. ♀, ♂.

*Nomada limbata*(!) Dalla Torre, 1896. Cat. Hym., v. 10, p. 354.

**luteopicta** Cockerell. Colo.

*Nomada luteopicta* Cockerell, 1905. Colo. Agr. Expt. Sta., Bul. 94: 83. ♂, ♀.

**malonella** Cockerell. Wash.

*Nomada (Nomada) malonella* Cockerell, 1910. Psyche 17: 93. ♀, ♂ ?

**malonina** Cockerell. Wash.

*Nomada (Nomada) malonina* Cockerell, 1910. Psyche 17: 94. ♂.

**marginella** Cockerell. Calif.

*Nomada (Nomada) marginella* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 576. ♀.

**mckenziei** Timberlake and Cockerell. Calif.

*Nomada mckenziei* Timberlake and Cockerell, 1937. Amer. Mus. Novitates 948: 4. ♀, ♂.

**media** Mitchell. N. C., Tenn.

*Nomada media* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 421, fig. 107. ♀, ♂.

**mediana** Swenk. Oreg., Calif.

*Nomada (Nomada) mediana* Swenk, 1913. Nebr. Univ., Studies 12: 49. ♀.

**melanosoma** Cockerell. Calif.

*Nomada melanosoma* Cockerell, 1916. Pomona Col. Jour. Ent. Zool. 8: 55. ♂.

**mendica** Mitchell. Vt., N. H.

*Nomada mendica* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 422, fig. 107. ♂.

**minima** Mitchell. Md. to N. C.

*Nomada minima* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 423. ♂.

**minuta** Swenk. Nebr.

*Nomada (Nomada) minuta* Swenk, 1913. Nebr. Univ., Studies 12: 44. ♀.

**munda** Cresson. Colo.

*Nomada munda* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 80. ♀.

**nigrociliata** Swenk. Nebr.

*Nomada (Nomada) nigrociliata* Swenk, 1913. Nebr. Univ., Studies 12: 32. ♀.

**nigrocincta** Smith. "Arctic America," Maine, Oreg.

*Nomada nigrocincta* Smith, 1879. Descr. New Species Hym. Brit. Mus., p. 99. ♀.

**nigrofasciata** Swenk. Nebr.

*Nomada (Nomada) nigrofasciata* Swenk, 1913. Nebr. Univ., Studies 12: 24. ♀.

**obliquella** Fowler. Calif. Host: *Andrena suavis* Timberlake.

*Nomada obliqua* Fowler, 1899. Ent. News 10: 160. ♂. Preocce.

*Nomada obliquella* Fowler, 1902. Calif. Agr. Expt. Sta., Rpt., 1898-1901, p. 329. N. name.

Biology: Linsley and MacSwain, 1959. Calif. Univ. Pubs. Ent. 16: 26 (habits, host).

**obscura** Fowler. Calif., Oreg. Host: *Andrena caerulea* Smith.

*Nomada obscura* Fowler, 1899. Ent. News 10: 160. ♂. Preocce.

*Nomada obscura* Fowler, 1902. Calif. Agr. Expt. Sta., Rpt., 1898-1901, p. 329. N. name.

*Nomada Fowleri* Cockerell, 1903. Ann. and Mag. Nat. Hist. (7) 12: 204. ♀.

Taxonomy: Rozen, 1966. Amer. Mus. Novitates 2244: 22-24, figs. 39-40 (larva).

Biology: Linsley and MacSwain, 1955. Wasmann Jour. Biol. 13: 275, pl. 1, fig. 4 (life history).

**obtusata** Swenk. N. Dak.

*Nomada (Nomada) obtusata*(!) Swenk, 1915. Nebr. Univ., Studies 15: 159. ♀. Lapsus *calami*, fide Swenk, personal communication with Dr. Hugo Rodeck.

**ochrohirta** Swenk. Nebr.

*Nomada (Nomada) ochrohirta* Swenk, 1913. Nebr. Univ., Studies 12: 34. ♀.



**odontocera** Cockerell. Calif.

*Nomada odontocera* Cockerell, 1916. Pomona Col. Jour. Ent. Zool. 8: 57. ♂.

**opposita** Cresson. Calif.

*Nomada opposita* Cresson, 1878. Amer. Ent. Soc., Trans. 8: 73. ♀.

**orba** Mitchell. N. Y. (Ithaca).

*Nomada orba* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 424, fig. 107. ♂.

**orcusella** Cockerell. Wash.

*Nomada (Nomada) orcusella* Cockerell, 1910. Psyche 17: 95. ♀.

**oregonica** Cockerell. Oreg., Calif.

*Nomada oregonica* Cockerell, 1903. Ann. and Mag. Nat. Hist. (7) 12: 205. ♀, ♂.

**osborni** Cockerell. Ariz.

*Nomada (Nomada) osborni* Cockerell, 1911. U. S. Natl. Mus., Proc. 41: 243. ♂.

**packardiella** Cockerell. Colo., Wash.?

*Nomada Packardiella* Cockerell, 1906. Ann. and Mag. Nat. Hist. (7) 17: 225. ♀.

**pallidipicta** Swenk. Nebr.

*Nomada (Nomada) pallidipicta* Swenk, 1913. Nebr. Univ., Studies 12: 48. ♂.

**parallela** Swenk. Nebr.

*Nomada (Nomada) parallela* Swenk, 1913. Nebr. Univ., Studies 12: 36. ♂.

**parata** Cresson. Colo.

*Nomada parata* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 81. ♀.

**parva** Robertson. Mich. to New England, south to Miss. and Tex.

*Nomada parva* Robertson, 1900. Canad. Ent. 32: 294. ♀, ♂.

*Nomada infantula* Cockerell, 1907. Entomologist 40: 98. ♀, ♂.

**propinqua** Swenk. Nebr.

*Nomada (Nomada) propinqua* Swenk, 1913. Nebr. Univ., Studies 12: 46. ♀, ♂.

**pulsatillae** Cockerell. Colo., Wash.?

*Nomada pulsatillae* Cockerell, 1906. Ann. and Mag. Nat. Hist. (7) 18: 69. ♀.

**pygmaea** Cresson. Minn. to Maine, south to Va., ?Colo.

*Nomada pygmaea* Cresson, 1863. Ent. Soc. Phila., Proc. 2: 299. ♂.

**rhodosoma rhodosoma** Cockerell. Calif., Nev.

*Nomada (Nomada) rhodosoma* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 571. ♀, ♂ ?

**rhodosoma rhodosomella** Cockerell. Colo.

*Nomada rhodosoma* var. *rhodosomella* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 571. ♂, ♀ ?

**robertsonella** Cockerell. Nev.

*Nomada robertsonella* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 613. ♀.

**rubrica** Provancher. Calif.

*Nomada rubrica* Provancher, 1896. Nat. Canad. 23: 8. ♀.

Taxonomy: Fowler, 1899. Ent. News 10: 162.

**salicicola** Swenk. Nebr.

*Nomada (Nomada) salicicola* Swenk, 1913. Nebr. Univ., Studies 12: 35. ♂.

**salicis** Robertson. Ill.

*Nomada salicis* Robertson, 1900. Acad. Sci. St. Louis, Trans. 10: 52. ♂.

**sayi** Robertson. Minn. to Que. and Maine, south to Ga.

*Nomada sayi* Robertson, 1893. Amer. Ent. Soc., Trans. 20: 276. ♀, ♂.

Taxonomy: Robertson, 1900. Canad. Ent. 32: 293-294. ♀, ♂ (redescribed, restricted).

**sedi** Cockerell. Colo.

*Nomada sedae* Cockerell, 1919. Ent. News 30: 292. ♀.

*Nomada sedi* Cockerell, 1920. Ann. and Mag. Nat. Hist. (9) 6: 201. Emend.

**semirugosa** Cockerell. Colo.

*Nomada semirugosa* Cockerell, 1929. Ann. and Mag. Nat. Hist. (10) 4: 297.

**skinneri** Cockerell. Conn. to N. C.

*Nomada skinneri* Cockerell, 1908. Ent. News 19: 323. ♀.

*sobrina* Mitchell. Mich. (Macomb Co.).

*Nomada sobrina* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 431, fig. 107. ♂.

*sphaerogaster* Cockerell. N. J., Wis.

*Nomada sphaerogaster* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 611. ♀.

*subaccepta* Cockerell. Colo.

*Nomada subaccepta* Cockerell, 1907. Entomologist 40: 267. ♂.

*subangusta* Cockerell. Calif.

*Nomada (Nomada) subangusta* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 570. ♂.

*subpacata* Swenk. N. Dak.

*Nomada (Nomada) subpacata* Swenk, 1913. Nebr. Univ., Studies 12: 55. ♀.

*subvicinalis* Cockerell. Calif.

*Nomada (Nomada) subvicinalis* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 576. ♂.

*taraxacella* Cockerell. N. Mex., Colo., Nebr., Wash.?

*Nomada ultima taraxacella* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 589. ♀.

Taxonomy: Cockerell, 1905. Colo. Agr. Expt. Sta., Bul. 94: 74. —Cockerell, 1911. U. S. Natl. Mus., Proc. 41: 238. ♀, ♂. —Swenk, 1913. Nebr. Univ., Studies 12: 22.

*tintinnabulum* Cockerell. Calif.

*Nomada (Nomada) tintinnabulum* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 572. ♀.

*townesi* Mitchell. Md. (Takoma Park).

*Nomada townesi* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 432. ♂.

*tyrellensis* Mitchell. N. C., Fla.

*Nomada tyrellensis* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 433. ♀.

*ulsterensis* Mitchell. N. Y., D. C.

*Nomada ulsterensis* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 433, fig. 107. ♂.

*ultima* Cockerell. Wash., Oreg., Calif.

*Nomada ultima* Cockerell, 1903. Ann. and Mag. Nat. Hist. (7) 12: 206. ♀.

*Nomada modocorum* Cockerell, 1903. Ann. and Mag. Nat. Hist. (7) 12: 444. ♂.

*ultimella septentrionalis* Swenk. Wash.

*Nomada (Nomada) ultimella septentrionalis* Swenk, 1913. Nebr. Univ., Studies 12: 50. ♀.

*ultimella ultimella* Cockerell. Calif.

*Nomada (Nomada) ultimella* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 572. ♀.

*undulaticornis* Cockerell. Colo.

*Nomada undulaticornis* Cockerell, 1906. Ann. and Mag. Nat. Hist. (7) 18: 70. ♂.

*valida* Smith. N. S. and N. Y. to B. C.

*Nomada valida* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 246. ♀.

*velutina* Swenk. Nebr.

*Nomada (Nomada) velutina* Swenk, 1913. Nebr. Univ., Studies 12: 39. ♀.

*vicina stevensi* Swenk. N. Dak.

*Nomada (Nomada) vicina stevensi* Swenk, 1913. Nebr. Univ., Studies 12: 56. ♀, ♂.

*vicina vicina* Cresson. Mich. to Que., New England, N. J. and Nebr. Host: *Andrena vicina* Sm.

*Nomada vicina* Cresson, 1863. Ent. Soc. Phila., Proc. 2: 292. ♀ (♂ misdet.).

Biology: Packard, 1878. Guide ... study of insects, 6th ed., p. 142 (life history).

*vicinalis infrarubens* Cockerell. Oreg.

*Nomada vicinalis* var. *infrarubens* Cockerell, 1905. Colo. Agr. Expt. Sta., Bul. 94: 84. ♂.

*vicinalis vicinalis* Cresson. Nebr., Colo.

*Nomada vicinalis* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 78. ♂.

Taxonomy: Swenk, 1913. Nebr. Univ., Studies 12: 41. ♂, ♀.

*wootonella* Cockerell. N. Mex.

*Nomada wootonella* Cockerell, 1909. Entomologist 42: 93. ♂.

*wyomingensis* Swenk. Wyo.

*Nomada (Nomada) wyomingensis* Swenk, 1913. Nebr. Univ., Studies 12: 52. ♀.

*ziziae* Swenk. N. Dak.

*Nomada (Nomada) ziziae* Swenk, 1915. Nebr. Univ., Studies 15: 4. ♀, ♂.

Genus **NOMADA** Subgenus **GNATHIAS** Robertson

*Gnathias* Robertson, 1903. Canad. Ent. 35: 173.

Type-species: *Nomada bella* Cresson. Orig. desig.

Taxonomy: Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 594-603. — Viereck *et al.*, 1905. Canad. Ent. 37: 282-283. — Swenk, 1913. Nebr. Univ., Studies 12: 11-15, 90-99. — Swenk, 1915. Nebr. Univ., Studies 15: 172-179. — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 346-354, fig. 98 (eastern U. S. spp.).

**bella bella** Cresson. Minn. to Que. and Maine, south to Fla.

*Nomada bella* Cresson, 1863. Ent. Soc. Phila., Proc. 2: 287. ♂.

*Nomada albofasciata* Smith, 1879. Descr. New Species Hym. Brit. Mus., p. 100. ♂.

Morphology: Snodgrass, 1941. Smithsn. Misc. Coll. 99: 55-56, pl. 27, figs. F-J.

**bella callura** Cockerell. Colo.

*Nomada (Gnathias) bella callura* Cockerell, 1911. U. S. Natl. Mus., Proc. 39: 657. ♂.

**clarescens** Cockerell. Colo.

*Nomada (Gnathias) clarescens* Cockerell, 1921. Amer. Mus. Novitates 24: 10. ♀.

**cuneata** (Robertson). Minn. to N. S., south to N. C.

*Gnathias cuneatus* Robertson, 1903. Canad. Ent. 35: 175. ♀, ♂ ?

*Gnathias cuneatus* form *decemnotatus* Robertson, 1903. Canad. Ent. 35: 175. ♀.

*Gnathias cuneatus* form *octonotatus* Robertson, 1903. Canad. Ent. 35: 175. ♀.

*Gnathias cuneatus* form *serenotatus* Robertson, 1903. Canad. Ent. 35: 176. ♀.

*Gnathias cuneatus* form *quadrisignatus* Robertson, 1903. Canad. Ent. 35: 176. ♀.

**custeriana** Cockerell. Colo.

*Nomada (Gnathias) custeriana* Cockerell, 1911. U. S. Natl. Mus., Proc. 41: 241. ♂.

**debilis** Timberlake. Calif.

*Nomada (Gnathias) debilis* Timberlake, 1954. Pan-Pacific Ent. 30: 135. ♀, ♂.

*Nomada (Gnathias) debilis* var. *a* Timberlake, 1954. Pan-Pacific Ent. 30: 136. ♀.

**fuscicincta** Swenk. N. Dak.

*Nomada (Gnathias) fuscicincta* Swenk, 1915. Nebr. Univ., Studies 15: 24. ♀, ♂.

**grayi eastonensis** Cockerell. Wash.

*Nomada (Gnathias) grayi eastonensis* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 597. ♀.

**grayi grayi** Cockerell. Oreg.

*Nomada Grayi* Cockerell, 1903. Ann. and Mag. Nat. Hist. (7) 12: 203. ♀.

**heterosticta** Cockerell. Idaho.

*Nomada (Gnathias) heterosticta* Cockerell, 1921. Amer. Mus. Novitates 24: 9. ♀.

**hydrophylli** Swenk. N. Dak., Ill., Md.

*Nomada (Gnathias) hydrophylli* Swenk, 1915. Nebr. Univ., Studies 15: 25. ♂.

*Gnathias xanthoparius* Robertson, 1928. Flowers and Insects, Carlinville, Ill., pp. 9, 101, 111, 152. ♂. Nomen nudum.

**klamathensis** Fox. Oreg.

*Nomada (Gnathias) klamathensis* Fox, 1926. Pan-Pacific Ent. 5: 212. ♂.

**lepida** Cresson. Minn. to Maine, south to Ga.

*Nomada lepida* Cresson, 1863. Ent. Soc. Phila., Proc. 2: 288. ♂.

**leucozona** Rodeck. Colo.

*Nomada (Gnathias) leucozona* Rodeck, 1931. Amer. Mus. Novitates 496: 4. ♂.

**louisianae** Cockerell. Nebr. and Minn. to N. Y., S. C. and La.

*Nomada (Gnathias) louisianae* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 602. ♀.

**maculata** Cresson. Minn. to Maine, south to Va.

*Nomada maculata* Cresson, 1863. Ent. Soc. Phila., Proc. 2: 303. ♀, ♂ ?

*Nomada volatilis* Smith, 1879. Descr. New Species Hym. Brit. Mus., p. 100. ♂.

**opacella** Timberlake. Calif. Host: *Andrena caerulea* Sm., *A. suavis* Timb.

*Nomada (Gnathias) opacella* Timberlake, 1954. Pan-Pacific Ent. 30: 133. ♀, ♂.

- Biology: Linsley and MacSwain, 1955. Wasmann Jour. Biol. 13: 256-270, pl. 1, fig. 1; pls. 2 and 3 (life history, hosts). — Linsley and MacSwain, 1959. Calif. Univ. Pubs. Ent. 16: 25-26 (habits, hosts).
- orophila** Cockerell. Colo., Wyo.  
*Nomada (Gnathias) orophila* Cockerell, 1921. Amer. Mus. Novitates 24: 8. ♂, ♀.
- ovata** (Robertson). Wyo., Minn. to Maine, south to S. C.  
*Gnathias ovatus* Robertson, 1903. Canad. Ent. 35: 175. ♀, ♂.  
*Gnathias ovatus* form *plenus* Robertson, 1903. Canad. Ent. 35: 175. ♀.  
*Gnathias ovatus* form *octomaculatus* Robertson, 1903. Canad. Ent. 35: 175. ♀.  
*Gnathias ovatus* form *sexmaculatus* Robertson, 1903. Canad. Ent. 35: 175. ♀.  
*Gnathias ovatus* form *quadrinaculatus* Robertson, 1903. Canad. Ent. 35: 175. ♀.  
*Gnathias ovatus* form *binotatus* Robertson, 1903. Canad. Ent. 35: 175. ♀.  
*Gnathias ovatus* form *unicolor* Robertson, 1903. Canad. Ent. 35: 175. ♀.  
*Nomada (Gnathias) carolinae* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 602. ♀.
- perbella** (Viereck). Oreg., Wash., B. C.  
*Gnathias perbella* Viereck, 1905. Canad. Ent. 37: 282. ♀, ♂.
- perplexa** Cresson. Minn. to Mass., south to Tenn. and N. C., ?Wyo.  
*Nomada perplexa* Cresson, 1863. Ent. Soc. Phila., Proc. 2: 306. ♀, ♂ ?
- Taxonomy: Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 600. ♂, ♀.  
*Nomada (Gnathias) cornelliana* Cockerell, 1908. Ent. Soc. Wash., Proc. 10: 84. ♂.
- perplexans** Cockerell. Wash.  
*Nomada (Gnathias) perplexans* Cockerell, 1910. Psyche 17: 94. ♂.
- physura** Cockerell. Nev.  
*Nomada (Gnathias) physura* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 599. ♂.
- rhodalis** Cockerell. Nev.  
*Nomada (Gnathias) rhodalis* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 600. ♀.
- rhodomelas** Cockerell. Oreg., B. C.  
*Nomada (Gnathias) rhodomelas* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 598. ♂, ♀?
- rubi** Swenk. N. Dak., Minn.  
*Nomada (Gnathias) rubi* Swenk, 1915. Nebr. Univ., Studies 15: 20. ♀, ♂.
- rubrella** Cockerell. Colo.  
*Nomada (Gnathias) rubrella* Cockerell, 1905. Colo. Agr. Expt. Sta., Bul. 94: 75. ♀.
- schwarzi contractula** Cockerell. N. Mex.  
*Nomada (Gnathias) schwarzi contractula* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 600. ♂.
- schwarzi schwarzi** Cockerell. Colo.  
*Nomada (Gnathias) schwarzi* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 599. ♂ (♀ misdet.).
- siouxensis** Swenk. Nebr., Wyo.  
*Nomada (Gnathias) siouxensis* Swenk, 1913. Nebr. Univ., Studies 12: 96. ♀.
- subnigrocincta** Swenk. Mass., N. J., Pa., N. C.  
*Nomada (Nomada) subnigrocincta* Swenk, 1915. Nebr. Univ., Studies 15: 155. ♀, (♂ misdet.).
- subrubi** Swenk. N. Dak.  
*Nomada (Gnathias) Subrubi* Swenk, 1915. Nebr. Univ. Studies 15: 176. ♀, ♂.
- utensis** Swenk. Colo.  
*Nomada (Gnathias) utensis* Swenk, 1913. Nebr. Univ., Studies 12: 97. ♀, ♂.
- vulpis** Cockerell. Wyo.  
*Nomada (Gnathias) vulpis* Cockerell, 1921. Amer. Mus. Novitates 24: 10. ♀.
- washingtoni** Cockerell. Wash.  
*Nomada (Gnathias) washingtoni* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 598. ♀.

Genus **NOMADA** Subgenus **PHOR** Robertson

*Phor* Robertson, 1903. *Canad. Ent.* 35: 173, 177.

Type-species: *Nomada integerrima* Dalla Torre. Orig. desig. and monotypic.  
(=*Nomada integra* Robertson) (preocc.).

Taxonomy: Swenk, 1913. *Nebr. Univ., Studies* 12: 12, 14. — Mitchell, 1962. *N. C. Agr. Expt. Sta. Tech. Bul.* 152: 377-379 (eastern U. S. spp.).

**integerrima** Dalla Torre. *Minn. to Que. and New England, south to N. C. and La.*

*Nomada integra* Robertson, 1893. *Amer. Ent. Soc., Trans.* 20: 276. ♀, ♂. Preocc.

*Nomada integerrima* Dalla Torre, 1896. *Cat. Hym. v.* 10, p. 353. N. name.

Taxonomy: Robertson, 1903. *Canad. Ent.* 35: 174, 175, 177. ♀, ♂.

**proxima** Cresson. *Maine, ?Conn.*

*Nomada proxima* Cresson, 1863. *Ent. Soc. Phila., Proc.* 2: 294. ♂.

Taxonomy: Viereck, 1916. *Conn. State Geol. and Nat. Hist. Survey, Bul.* 22 (3): 726.

**siccorum** Cockerell. *Colo.*

*Nomada (Phor) siccorum* Cockerell, 1919. *Ent. News* 30: 291. ♂.

**subgracilis** Cockerell. *Calif.*

*Nomada (Phor) subgracilis* Cockerell, 1903. *Acad. Nat. Sci. Phila., Proc.* 55: 569. ♂.

**vexator** Cockerell. *Colo.*

*Nomada vexator* Cockerell, 1909. *Entomologist* 42: 92. ♀, ♂.

Genus **NOMADA** Subgenus **HEMINOMADA** Cockerell and Atkins

*Nomada* subg. *Heminomada* Cockerell and Atkins, 1902. *Ann. and Mag. Nat. Hist.* (7) 10: 42.

Type-species: *Nomada obliterata* Cresson. Orig. desig. and monotypic.

*Xanthidium* Robertson, 1903. *Canad. Ent.* 35: 174, 177. Preocc.

Type-species: *Nomada luteola* Olivier. Orig. desig.

Taxonomy: Cockerell, 1903. *Acad. Nat. Sci. Phila., Proc.* 55: 564-569, 580-587 (part).

— Robertson, 1903. *Canad. Ent.* 35: 173, 174-175, 177. — Viereck *et al.*, 1905. *Canad. Ent.* 37: 284-285. — Swenk, 1913. *Nebr. Univ., Studies* 12: 8-11, 13-15, 57-76. — Swenk, 1915. *Nebr. Univ., Studies* 15: 163-169. — Mitchell, 1962. *N. C. Agr. Expt. Sta. Tech. Bul.* 152: 380-400, fig. 105 (eastern U. S. spp.).

**agynia** Cockerell. *Colo.*

*Nomada agynia* Cockerell, 1905. *Colo. Agr. Expt. Sta., Bul.* 94: 81. ♂.

**alpha alpha** Cockerell. *Colo.*

*Nomada alpha* Cockerell, 1905. *Colo. Agr. Expt. Sta., Bul.* 94: 84. ♀.

Taxonomy: Swenk, 1913. *Nebr. Univ., Studies* 12: 71. ♀, ♂.

**alpha dialpha** Cockerell. *Colo. June.*

*Nomada alpha* var. *dialpha* Cockerell, 1921. *Amer. Mus. Novitates* 24: 3. ♀.

**alpha paralpha** Cockerell. *Colo.*

*Nomada alpha* var. *paralpa* Cockerell, 1921. *Amer. Mus. Novitates* 24: 3. ♀.

**annulata** Smith. *N. C. Host: Andrena macra* Mitch.

*Nomada annulata* Smith, 1854. *Cat. Hym. Brit. Mus.*, v. 2, p. 248. ♀, (♂ misdet.).

**arizonica** Cockerell. *Ariz.*

*Nomada (Xanthidium) arizonica* Cockerell, 1911. *U. S. Natl. Mus., Proc.* 41: 242. ♂.

**ashmeadi** Cockerell. *Calif.*

*Nomada (Xanthidium) ashmeadi* Cockerell, 1903. *Acad. Nat. Sci. Phila., Proc.* 55: 568. ♀.

**autumnalis** Mitchell. *Mich. (Oakland Co.).*

*Nomada (?Xanthidium) autumnalis* Mitchell, 1962. *N. C. Agr. Expt. Sta. Tech. Bul.* 152: 382. ♂.

**avalonica** Cockerell. *Calif.*

*Nomada (Holonomada) avalonica* Cockerell, 1938. *Ann. and Mag. Nat. Hist.* (11) 2: 152. ♀.

**bethunei** Cockerell. *Mich., Ohio.*

*Nomada bethunei* Cockerell, 1903. *Acad. Nat. Sci. Phila., Proc.* 55: 607. ♂.

**bishoppi** Cockerell. Minn. to Maine, south to Miss. and Fla.

*Nomada (Xanthidium) luteola bishoppi* Cockerell, 1911. U. S. Natl. Mus., Proc. 39: 655. ♀.

**calloxantha** Cockerell. Wyo.

*Nomada (Xanthidium) calloxantha* Cockerell, 1921. Amer. Mus. Novitates 24: 4. ♀.

**capitalis** Mitchell. N. H., Mich., N. C., Tenn.

*Nomada (Heminomada) capitalis* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 385. ♀.

**citrina citrina** Cresson. Pacific Coast.

*Nomada citrina* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 79 ♀.

**citrina flavomarginata** Swenk. Nebr.

*Nomada (Heminomada) citrina flavomarginata* Swenk, 1913. Nebr. Univ., Studies 12: 67-71. ♀, ♂.

**citrina rufula** Cockerell. Idaho.

*Nomada citrina* var. *rufula* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 586. ♀.

**civilis civilis** Cresson. United States west of Nebr.

*Nomada civilis* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 78. ♂.

**civilis spokaneensis** Cockerell. Wash.

*Nomada civilis spokaneensis* Cockerell, 1910. Psyche 17: 92. ♀.

**collinsiana** Cockerell. Colo.

*Nomada (Xanthidium) collinsiana* Cockerell, 1905. Colo. Agr. Expt. Sta., Bul. 94: 79. ♀.

**coloradensis** Cockerell. Colo.

*Nomada coloradensis* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 603. ♀.

Taxonomy: Cockerell, 1905. Colo. Agr. Expt. Sta., Bul. 94: 84. ♀, ♂.

**colorata** Mitchell. N. Y., Mich.

*Nomada (Heminomada) colorata* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 386. ♀.

**concinnulla** Cockerell. Colo.

*Nomada (Xanthidium) concinnula* Cockerell, 1921. Amer. Mus. Novitates 24: 6. ♀.

**coquilletti** Cockerell. Calif., Wash., Idaho.

*Nomada (Xanthidium) coquilletti* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 567. ♂.

**crawfordi crawfordi** Cockerell. Colo., Nebr., Wyo.

*Nomada (Xanthidium) crawfordi* Cockerell, 1905. Colo. Agr. Expt. Sta., Bul. 94: 79. ♀.

Taxonomy: Cockerell, 1906. Amer. Mus. Nat. Hist., Bul. 22: 437. ♀, ♂.

**crawfordi lachrymosa** Cockerell. Wyo.

*Nomada (Xanthidium) crawfordi lachrymosa* Cockerell, 1921. Amer. Mus. Novitates 24: 5. ♀.

**decempunctata** Cockerell. Calif.

*Nomada (Xanthidium) decempunctata* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 565. ♂.

**dentariae** (Robertson). Ill. to N. Y., south to Great Smokies Natl. Park.

*Xanthidium dentariae* Robertson, 1903. Canad. Ent. 35: 178. ♂.

**dilucida** Cresson. Colo.

*Nomada dilucida* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 80. ♀.

**ednae** Cockerell. Colo.

*Nomada (Xanthidium) Ednae* Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 19: 537. ♂.

**electa** Cresson. Ill., Conn., Mass., Va.

*Nomada electa* Cresson, 1863. Ent. Soc. Phila., Proc. 2: 290. ♀, ♂.

*Nomada (Xanthidium?) mimula* Cockerell, 1908. Ent. Soc. Wash., Proc. 10: 66. ♀.

**electella** Cockerell. R. I. to Ga.

*Nomada electella* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 612. ♀.

**elrodi** Cockerell. Mont., Nebr., Colo., Tex.

*Nomada (Xanthidium) elrodi* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 583. ♂.

Taxonomy: Swenk, 1913. Nebr. Univ., Studies 12: 62. ♀, ♂ (variety).

**festiva** Cresson. Mass., N. J.

*Nomada festiva* Cresson, 1863. Ent. Soc. Phila., Proc. 2: 289. ♀.

**fragariae** Mitchell. Va., N. C., Fla.

*Nomada (Heminomada) fragariae* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 391, fig. 105. ♂.

**fragilis fragilis** Cresson. Colo., Nebr., N. Mex., Calif.

*Nomada fragilis* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 79. ♂.

**fragilis mesosticta** Cockerell. Calif.

*Nomada fragilis mesosticta* Cockerell, 1939. Ann. and Mag. Nat. Hist. (11) 3: 182. ♂.

**gillettei** Cockerell. Colo.

*Nomada gillettei* Cockerell, 1905. Colo. Agr. Expt. Sta., Bul. 94: 81. ♂.

**graenicheri** Cockerell. Wis.

*Nomada (Xanthidium) Graenicheri* Cockerell, 1905. Canad. Ent. 37: 189. ♀.

Taxonomy: Graenicher, 1911. Pub. Mus. City Milwaukee, Bul. 1: 238. ♀, ♂.

**imbricata** Smith. N. Y. to N. S. Host: *Andrena vicina* Sm., *Halictus rubicundus* (Chr.)?

*Nomada imbricata* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 246. ♀.

Taxonomy: Viereck, 1916. Conn. State Geol. and Nat. Hist. Survey, Bul. 22 (3): 727. ♀.

Morphology: Packard, 1897. N. Y. Ent. Soc., Jour. 5: 83-84.

**jocularis** Cresson. Nev.

*Nomada jocularis* Cresson, 1879. Amer. Ent. Soc., Trans. 7: 202. ♀.

**laramienseis** Swenk. Wyo.

*Nomada (Heminomada) laramienseis* Swenk, 1913. Nebr. Univ., Studies 12: 75. ♂.

**luteola** Olivier. East. United States.

*Nomada luteola* Olivier, 1811. Encycl. Meth., v. 8, p. 365.

**maculiventer** Swenk. N. Dak.

*Nomada (Heminomada) maculiventer* Swenk, 1915. Nebr. Univ., Studies 15: 163. ♀, ♂.

**miniata** Smith. Ga.

*Nomada miniata* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 250. ♀.

**obliterata** Cresson. Minn. to N. Y., south to S. C. Host: *Andrena vicina* Sm.

?*Nomada pulchella* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 247. ♂.

*Nomada obliterata* Cresson, 1863. Ent. Soc. Phila., Proc. 2: 301. ♀.

*Nomada viburni* Robertson, 1897. Acad. Sci. St. Louis, Trans. 7: 341. ♂.

**ochlerata** Mitchell. Mich. (Ann Arbor).

*Nomada (?Heminomada) ochlerata* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 396. ♂.

**ornithica** Cockerell. Colo.

*Nomada (Xanthidium) ornithica* Cockerell, 1906. Canad. Ent. 38: 161. ♂.

**pallidella** Cockerell. Colo.

*Nomada pallidella* Cockerell, 1905. Colo. Agr. Expt. Sta., Bul. 94: 82. ♂.

**perivincta perivincta** Cockerell. Colo.

*Nomada (Xanthidium) perivincta* Cockerell, 1905. Colo. Agr. Expt. Sta., Bul. 94: 80. ♂.

**perivincta semirufula** Cockerell. Colo.

*Nomada (Xanthidium) perivincta* var. *semirufula* Cockerell, 1905. Colo. Agr. Expt. Sta., Bul. 94: 80. ♀.

**placitensis** Cockerell. N. Mex.

*Nomada placitensis* Cockerell, 1903. Ann. and Mag. Nat. Hist. (7) 12: 446. ♀.

**pseudops** Cockerell. Wis. to Mass.

*Nomada (Xanthidium) pseudops* Cockerell, 1905. Canad. Ent. 37: 189. ♀.

**pyrrha** Cockerell. Calif.

*Nomada (Xanthidium) pyrrha* Cockerell, 1916. Pomona Col. Jour. Ent. Zool. 8: 55. ♀.

**rhodoxantha** Cockerell. Colo.

*Nomada (Xanthidium) rhodoxantha* Cockerell, 1905. Colo. Agr. Expt. Sta., Bul. 94: 78. ♀.

*rivalis* Cresson. Calif., Wash.

*Nomada rivalis* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 79. ♂.

Taxonomy: Cockerell, 1910. Psyche 17: 97.

*ruidosensis* Cockerell. N. Mex., Colo.

*Nomada ruidosensis* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 594. ♂.

*sanctaerucis* Cockerell. Calif.

*Nomada (Xanthidium) sanctaerucis* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 566. ♂.

*subrutila* Lovell and Cockerell. Mich. to New England, ?Colo.

*Nomada (Xanthidium) subrutila* Lovell and Cockerell, 1905. Psyche 12: 40. ♂.

*subsimilis* Cockerell. Calif.

*Nomada (Xanthidium) subsimilis* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 567. ♂.

*suda* Cresson. Nev.

*Nomada suda* Cresson, 1879. Amer. Ent. Soc., Trans. 7: 203. ♀.

*sulphurata* Smith. Minn. to Mass., south to Miss. and Ga., ?Utah.

*Nomada sulphurata* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 249. ♀.

*Nomada luteoloides* Robertson, 1895. Amer. Ent. Soc., Trans. 22: 124. ♀.

Taxonomy: Rodeck, 1931. Amer. Mus. Novitates 496: 11 (Utah record).

*tricurta* Swenk. N. Dak.

*Nomada (Heminomada) tricurta* Swenk, 1915. Nebr. Univ., Studies 15: 11. ♀, ♂.

*truttarum* Cockerell. N. Mex.

*Nomada (Xanthidium) truttarum* Cockerell, 1909. Entomologist 42: 94. ♂.

*vallesina honorata* Cockerell. Colo.

*Nomada (Xanthidium) vallesina* var. *honorata* Cockerell, 1922. Ann. and Mag. Nat. Hist. (9) 10: 269. ♀.

*vallesina vallesina* Cockerell. N. Mex., Colo. Host: *Andrena irana* Ckll.?

*Nomada vallesina* Cockerell, 1906. Ann. and Mag. Nat. Hist. (7) 17: 226. ♀.

Biology: Hicks, 1934. Colo. Univ., Studies 21: 267 (host).

*vernonensis* Cockerell. B. C.

*Nomada versonensis* Cockerell, 1916. Canad. Ent. 48: 273. ♂.

*xantholepis* Cockerell. Colo.

*Nomada (Xanthidium) xantholepis* Cockerell, 1911. U. S. Natl. Mus., Proc. 41: 239. ♂.

*xanthophila* Cockerell. N. Mex.

*Nomada xanthophila* Cockerell, 1900. Ann. and Mag. Nat. Hist. (7) 5: 414. ♂.

*xanthura* Cockerell. N. Y. to N. S.

*Nomada xanthura* Cockerell, 1908. Ent. Soc. Wash., Proc. 10: 84. ♀.

#### Genus NOMADA Subgenus HOLONOMADA Robertson

*Holonomada* Robertson, 1903. Canad. Ent. 35: 174, 177.

Type-species: *Nomada superba* Cresson. Orig. desig.

Revision: Evans, 1972. Wasmann Jour. Biol. 30: 1-34, 5 figs. (included spp.).

Taxonomy: Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 561-563, 580-588 (part). — Viereck

et al., 1905. Canad. Ent. 37: 283-284, 287. — Swenk, 1913. Nebr. Univ., Studies 12: 8, 77-90.

— Swenk, 1915. Nebr. Univ., Studies 15: 169-172. — Mitchell, 1962. N. C. Agr. Expt. Sta.

Tech. Bul. 152: 361-364, fig. 102 (eastern U. S. spp.).

#### SPECIES GROUP EDWARDSII

*edwardsii edwardsii* Cresson. B. C., Wash., Colo., Oreg., Calif.; Mexico (Baja California). Host:

*Andrena perimela* Ckll.

*Nomada Edwardsii* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 72. "♂" = ♀.

*Nomada intercepa* Smith, 1879. Descr. New Species Hym. Brit. Mus., p. 100. ♂.

*Nomada (Holonomada) edwardsii* var. *australior* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 562. ♂.



Biology: Linsley and MacSwain, 1955. Wasmann Jour. Biol. 13: 270-274, pl. 1, fig. 6; pls. 4 and 5 (habits, host).

**edwardsii vinnula** Cresson. Nev.

*Nomada vinnula* Cresson, 1879. Amer. Ent. Soc., Trans. 7: 202. ♀, ♂.

**henningeri** Evans. N. Mex. (Kenne), Tex. (Olney).

*Nomada (Holonomada) henningeri* Evans, 1972. Wasmann Jour. Biol. 30: 21. ♀.

**linsleyi** Evans. Calif. (Auburn and Westley).

*Nomada (Holonomada) linsleyi* Evans, 1972. Wasmann Jour. Biol. 30: 26. ♀.

**pecosensis** Cockerell. N. Mex., Colo.

*Nomada xanthophila* var. *pecosensis* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 585. ♀.

Taxonomy: Cockerell, 1905. Colo. Agr. Expt. Sta., Bul. 94: 78. ♂, ♀.

**rhodotricha** Cockerell. Calif.

*Nomada (Holonomada) rhodotricha* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 562. ♀.

#### SPECIES GROUP SUPERBA

**affabilis affabilis** Cresson. Ill. to Mass., south to Fla.

*Nomada affabilis* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 74. ♂.

Taxonomy: Robertson, 1895. Amer. Ent. Soc., Trans. 22: 123. ♀, ♂.

**affabilis dallasensis** Cockerell. Tex and Kans. to D. C.

*Nomada affabilis dallasensis* Cockerell, 1911. U. S. Natl. Mus., Proc 39: 654. ♀, ♂.

**grandis** Cresson. Colo., Tex.

*Nomada grandis* Cresson, 1875. Rpt. Geog. Geol. Expl. and Survey West of 100th Meridian, Ch. 7, p. 725. ♀.

*Nomada (Holonomada) magnifica* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 587. ♀.

**hurdi** Evans. Calif. (Joshua Tree Natl. Mon. and Kramer Hills).

*Nomada (Holonomada) hurdi* Evans, 1972. Wasmann Jour. Biol. 30: 22, figs. 1-4. ♂.

**parkeri** Evans. Ariz., N. Mex.

*Nomada (Holonomada) parkeri* Evans, 1972. Wasmann Jour. Biol. 30: 28. ♀.

**superba malvastri** Swenk. Nebr.

*Nomada (Holonomada) superba malvastri* Swenk, 1913. Nebr. Univ., Studies 12: 80. ♂.

*Nomada (Holonomada) nebrascensis* Swenk, 1913. Nebr. Univ., Studies 12: 80. ♀.

**superba superba** Cresson. D. C. and N. C., west to Wis. and Colo.

*Nomada superba* Cresson, 1863. Ent. Soc. Phila., Proc. 2: 281. ♂.

Taxonomy: Robertson, 1897. Acad. Sci. St. Louis, Trans. 7: 340. ♂, ♀.

#### SPECIES GROUP UNASSIGNED

**hemphilli** Cockerell. Wash., Idaho, Oreg., Nev., Calif.; Mexico (Baja California).

*Nomada (Holonomada) hemphilli* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 561. ♂.

*Nomada (Holonomada) excurrans* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 562. ♂.

*Nomada (Nomada?) excellens* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 573. ♀.

#### Genus NOMADA Subgenus LAMINOMADA Rodeck

*Nomada* subg. *Laminomada* Rodeck, 1947. Ent. Soc. Amer., Ann. 40: 266.

Type-species: *Nomada (Holonomada) hesperia* Cockerell. Orig. desig. and monotypic.

**hesperia falconis** Rodeck. Calif.

*Nomada (Laminomada) hesperia falconis* Rodeck, 1947. Ent. Soc. Amer., Ann. 40: 270. ♂, ♀.

**hesperia hesperia** Cockerell. Calif., Oreg., Wash.

*Nomada (Holonomada) hesperia* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 563. ♂.

*Nomada (Holonomada) flavopicta* Swenk, 1913. Nebr. Univ., Studies 12: 84. ♀.

Taxonomy: Rodeck, 1947. Ent. Soc. Amer., Ann. 40: 266. ♂, ♀.

Genus *NOMADA* Subgenus *PACHYNOMADA* Rodeck

*Nomada* subg. *Pachynomada* Rodeck, 1945. Ent. News 56: 180.

Type-species: *Nomada (Holonomada) vineta* Say. Orig. desig.

**adducta** Cresson. Colo., Nebr.

*Nomada adducta* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 73. ♂.

Taxonomy: Swenk, 1913. Nebr. Univ., Studies 12: 21. ♀.

**asteris** Swenk. Kans.

*Nomada (Holonomada) asteris* Swenk, 1913. Nebr. Univ., Studies 12: 89. ♀.

**besseyi** Swenk. Kans.

*Nomada (Holonomada) besseyi* Swenk, 1913. Nebr. Univ., Studies 12: 85. ♂.

**morrisoni flagellaris** Cockerell. Colo.

*Nomada (Xanthidium) morrisoni flagellaris* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 587. ♀.

**morrisoni morrisoni** Cresson. Colo. Host: *Andrena irana* Ckll.

*Nomada Morrisoni* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 72. ♀.

Biology: Hicks, 1934. Colo. Univ., Studies 21: 267 (host).

**victrix** Cockerell. Tex.

*Nomada victrix* Cockerell, 1911. U. S. Natl. Mus., Proc. 39: 657. ♀.

**vineta heterochroa** Cockerell. Colo.

*Nomada vineta* var. *heterochroa* Cockerell, 1921. Amer. Mus. Novitates 24: 1. ♂.

**vineta vineta** Say. Kans. and Nebr., east to N. C.

*Nomada vineta* Say, 1837. Boston Jour. Nat. Hist. 1: 401. ♀ (♂ misdet.).

Taxonomy: Robertson, 1903. Canad. Ent. 35: 177. ♀, ♂. — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 379-380 (redescription).

**zebrata** Cresson. Colo., Kans., Nebr., N. Mex., ?Ariz.

*Nomada zebrata* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 73. ♀, ♂.

Genus *NOMADA* Subgenus *CALLINOMADA* Rodeck

*Nomada* subg. *Callinomada* Rodeck, 1945. Ent. News 56: 181.

Type-species: *Nomada (Holonomada) antonita* Cockerell. Orig. desig.

Taxonomy: Rodeck, 1949. Ent. Soc. Amer., Ann. 42: 174-186. — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 372-377 (eastern U. S. spp.).

**antonita** Cockerell. Colo.

*Nomada antonita* Cockerell, 1909. Canad. Ent. 41: 35. ♂.

**aquilarum** Cockerell. North. Great Plains, east to Wis. and South. Canada, ?N. Mex.

*Nomada aquilarum* Cockerell, 1903. Ann. and Mag. Nat. Hist. (7) 12: 208. ♂.

*Nomada cockerelli* Graenicher, 1911. Pub. Mus. City Milwaukee, Bul. 1: 240. ♂.

*Nomada (Holonomada) dacotensis* Swenk, 1913. Nebr. Univ., Studies 12: 88. ♀.

**mutans** Cockerell. Oreg., Wash.

*Nomada (Holonomada) mutans* Cockerell, 1910. Psyche 17: 91. ♀.

**placida** Cresson. Nebr. to N. Y., south to N. C.

*Nomada placida* Cresson, 1863. Ent. Soc. Phila., Proc. 2: 291. ♀, ♂.

Taxonomy: Rodeck, 1945. Ent. News 56: 181 (redescription).

**rodecki** Mitchell. N. C. (Southern Pines).

*Nomada (Callinomada) rodecki* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 376. ♂.

**snowii** Cresson. Colo., Nebr., S. Dak., N. Dak.

*Nomada Snowii* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 75. ♀, ♂.

*Nomada (Holonomada) omahaensis* Swenk, 1915. Nebr. Univ., Studies 15: 171. ♂.

**verecunda** Cresson. Oreg., Nev., Calif.

*Nomada verecunda* Cresson, 1879. Amer. Ent. Soc., Trans. 7: 203. ♀, ♂.

**Genus NOMADA Subgenus MICRONOMADA Cockerell and Atkins**

*Nomada* subg. *Micronomada* Cockerell and Atkins, 1902. Ann. and Mag. Nat. Hist. (7) 10: 44.

Type-species: *Nomada modesta* Cresson. Orig. desig. and monotypic.  
*Cephen* Robertson, 1903. Canad. Ent. 35: 174, 176.

Type-species: *Nomada texana* Cresson. Orig. desig. and monotypic.

Taxonomy: Robertson, 1903. Canad. Ent. 35: 173. —Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 593 (part), 608-611. —Swenk, 1913. Nebr. Univ., Studies 12: 12, 104-112. —Swenk, 1915. Nebr. Univ., Studies 15: 181-188. —Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 354-361, figs. 99-101 (eastern U. S. spp.).

**amorphae** Swenk. Nebr., Colo.

*Nomada* (*Micronomada*) *amorphae* Swenk, 1913. Nebr. Univ., Studies 12: 108. ♀, ♂.

**arenicola** Swenk. Nebr.

*Nomada* (*Micronomada*) *arenicola* Swenk, 1913. Nebr. Univ., Studies 12: 107. ♀, ♂.

**belfragei** Cresson. Tex., Kans.

*Nomada Belfragei* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 72. ♀.

*Nomada belfragei* var. *xanthogaster* Cockerell, 1911. U. S. Nat. Mus., Proc. 39: 644. ♀.

Taxonomy: Swenk, 1915. Nebr. Univ. Studies 15: 184. ♀, ♂.

**crucis** Cockerell. Ariz., N. Mex., Tex., Colo., Utah.

*Nomada crucis* Cockerell, 1903. Ann. and Mag. Nat. Hist. (7) 12: 212. ♂.

**fervida** Smith. S. C. to Fla., La.

*Nomada fervida* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 247. ♀.

*Nomada* (*Micronomada*) *crassula* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 610. "♀"  
 = ♂.

**formula** Viereck. Calif.

*Nomada formula* Viereck, 1903. Acad. Nat. Sci. Phila., Proc. 54: 728. ♀.

Taxonomy: Cockerell, 1911. U. S. Natl. Mus., Proc. 39: 658. ♂.

**garciana** Cockerell. N. Mex., Tex.

*Nomada* (*Micronomada*) *garciana* Cockerell, 1907. Entomologist 40: 265. ♂.

**gutierreziae** Cockerell. N. Mex., Ariz., Colo.

*Nomada gutierreziae* Cockerell, 1896. Canad. Ent. 28: 284. ♀.

**heiligbrodtii** Cresson. Minn. to New England, south to Fla. and Tex.

*Nomada Heiligbrodtii* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 75. ♀.

*Nomada* (*Micronomada*) *tiftonensis* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 610.  
 ♂.

*Nomada* (*Micronomada*) *modesta rivertonensis* Cockerell, 1903. Acad. Nat. Sci. Phila.,  
 Proc. 55: 610. ♀.

**lamarensis** Cockerell. Colo., Tex.

*Nomada* (*Micronomada*) *lamarensis* Cockerell, 1905. Colo. Agr. Expt. Sta., Bul. 94: 76. ♂.

Taxonomy: Cockerell, 1911. U. S. Natl. Mus., Proc. 39: 652. ♂, ♀.

**limata** Cresson. Mexico; Tex.

*Nomada limata* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 76. ♀.

**lippiae lippiae** Cockerell. N. Mex.

*Nomada lippiae* Cockerell, 1903. Ann. and Mag. Nat. Hist. (7) 12: 214. ♂.

**lippiae sublippiae** Cockerell. N. Mex.

*Nomada lippiae* var. *sublippiae* Cockerell, 1907. Entomologist 40: 265. ♂.

**melanoptera** Cockerell. Colo.

*Nomada* (*Micronomada*) *melanoptera* Cockerell, 1921. Amer. Mus. Novitates 24: 5. ♀.

**mittelli** Cockerell. Tex.

*Nomada* (*Micronomada*) *mittelli* Cockerell, 1911. U. S. Natl. Mus., Proc. 39: 654. ♀, ♂.

**modesta** Cresson. N. Y. to Ala.

*Nomada modesta* Cresson, 1863. Ent. Soc. Phila., Proc. 2: 286. ♀, ♂.

*Nomada (Micronomada) modesta* var. *vegana* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 610. ♀.

*Nomada (Micronomada) vegana* var. *nitescens* Cockerell, 1905. Colo. Agr. Expt. Sta., Bul. 94: 76. ♀.

**neomexicana** Cockerell. N. Mex.

*Nomada neomexicana* Cockerell, 1903. Ann. and Mag. Nat. Hist. (7) 12: 209. ♀, ♂.

**pallidellutea** Swenk. Ariz.; Mexico (Baja California).

*Nomada (Micronomada) pallidellutea* Swenk, 1915. Nebr. Univ., Studies 15: 32. ♀, ♂.

*Nomada (Micronomada) penisularis* Cockerell, 1925. Pan-Pacific Ent. 1: 180. ♀, ♂.

**putnami** Cresson. Utah, Colo., Nebr., Kans., N. Mex.

*Nomada Putnami* Cresson, 1876. Davenport Acad. Nat. Sci., Proc. 1: 210. ♀, "♀" = ♂.

Taxonomy: Swenk, 1913. Nebr. Univ., Studies 12: 111. ♀.

**ridingsii** Cresson. Colo.

*Nomada Ridingsii* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 74. ♀.

**semisuavis** Cockerell. Wash., Calif.

*Nomada (Micronomada) semisuavis* Cockerell, 1910. Psyche 17: 92. ♂.

Taxonomy: Cockerell, 1911. U. S. Natl. Mus., Proc. 39: 658. ♀.

**simplicicoxa** Swenk. Ariz.

*Nomada (Micronomada) simplicicoxa* Swenk, 1915. Nebr. Univ., Studies 15: 182. ♀, ♂.

**suavis** Cresson. Wash., Idaho, Oreg., Calif. Host: *Nomia melanderi* Ckll.

*Nomada suavis* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 74. ♀ (♂ misdet.).

*Nomada flavipes* Provancher, 1888. Addit. Corr. Faune Ent. Canada, Hym., p. 426. ♀.

**texana** Cresson. Tex. and La. north to Ill., west to Colo., Ariz.

*Nomada texana* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 271. ♀, ♂.

Taxonomy: Robertson, 1903. Canad. Ent. 35: 176. ♀, ♂.

**uhleri** Cockerell. Colo.

*Nomada (Micronomada) uhleri* Cockerell, 1905. Colo. Agr. Expt. Sta., Bul. 94: 77. ♂.

**vierecki** Cockerell. N. Mex., Tex., Colo., Nebr.; Mexico.

*Nomada vierecki* Cockerell, 1903. Ann. and Mag. Nat. Hist. (7) 12: 211. ♀, ♂.

*Nomada (Micronomada) vierecki convolvuli* Swenk, 1913. Nebr. Univ., Studies 12: 109. ♀, ♂.

*Nomada vierecki* race *cushmani* Cockerell, 1926. Ann. and Mag. Nat. Hist. (9) 17: 307.

**wheeleri engelmanniae** Cockerell. Tex.

*Nomada wheeleri engelmanniae* Cockerell, 1911. U. S. Natl. Mus., Proc. 39: 649. ♀ (♂ misdet.).

**wheeleri wheeleri** Cockerell. Tex.

*Nomada (Micronomada) wheeleri* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 604. ♀.

**wisconsinensis** Graenicher. Minn., Wis., Mich., Ill.

*Nomada wisconsinensis* Graenicher, 1911. Pub. Mus. City Milwaukee, Bul. 1: 239.

**Genus NOMADA Subgenus CENTRIAS Robertson**

*Centrias* Robertson, 1903. Canad. Ent. 35: 174, 176.

Type-species: *Nomada erigeronis* Robertson. Orig. desig.

Taxonomy: Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 588, 591-593, 608-612. — Viereck

et al., 1905. Canad. Ent. 37: 283. — Swenk, 1913. Nebr. Univ., Studies 12: 13, 103-104.

— Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 364-365.

**erigeronis** Robertson. Kans. and Nebr., east to Mass.

*Nomada erigeronis* Robertson, 1897. Acad. Sci. St. Louis, Trans. 7: 341. ♀.

*Centrias erigerontis*(!) Robertson, 1928. Flowers and Insects, Carlinville, Ill., pp. 9, 66, 69.

Taxonomy: Robertson, 1903. Canad. Ent. 35: 176. ♀, ♂.

**Genus NOMADA Subgenus NOMADULA Cockerell**

*Nomada* subg. *Nomadula* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 611.

Type-species: *Nomada articulata* Smith. Orig. desig. (= *Nomada americana* "Kirby," Robertson, Cockerell).

Taxonomy: Viereck *et al.*, 1905. Canad. Ent. 37: 285-287. — Swenk, 1913. Nebr. Univ., Studies 12: 13, 101-103. — Swenk, 1915. Nebr. Univ., Studies 15: 25-27. — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 365-371 (eastern U. S. spp.).

**articulata** Smith. N. Dak. and Nebr., east to New England, south to Fla. and La.

?*Nomada americana* Kirby, 1837. Fauna Bor.-Amer., p. 269. ♀. Type missing; species uncertain.

*Nomada articulata* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 248. ♂.

*Nomada incerta* Cresson, 1863. Ent. Soc. Phila., Proc. 2: 309. ♀.

*Nomada (Centrias) americana dacotana* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 592. ♂.

*Nomada (Nomada) bilobata* Swenk, 1913. Nebr. Univ., Studies 12: 25. ♂, (♀ misdet.).

Taxonomy: Cockerell, 1905. Amer. Ent. Soc., Trans. 31: 310.

**australis** Mitchell. Fla. to N. C., N. Y., Ind.

*Nomada (Nomadula) australis* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 367. ♀, ♂.

**crotchii crotchii** Cresson. Calif.

*Nomada Crotchii* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 81. ♀.

**crotchii nigrior** Cockerell. Calif.

*Nomada (Xanthidium) crotchii* var. *nigrior* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 564. ♀.

Taxonomy: Cockerell, 1916. Pomona Jour. Ent. Zool. 8: 54. ♂.

**erythrochroa** Cockerell. Wash., Idaho.

*Nomada erythrochroa* Cockerell, 1903. Ann. and Mag. Nat. Hist. (7) 12: 203. ♀.

**erythrospila** Cockerell. Calif.

*Nomada (Nomada) erythrospila* Cockerell, 1916. Pomona Jour. Ent. Zool. 8: 56. ♂.

**frankei** Cockerell. Colo.

*Nomada frankei* Cockerell, 1929. N. Y. Ent. Soc., Jour. 37: 443. ♂.

**frieseana** Cockerell. Colo.

*Nomada Frieseana* Cockerell, 1904. Ann. and Mag. Nat. Hist. (7) 14: 28. ♀.

Taxonomy: Cockerell, 1911. U. S. Natl. Mus., Proc. 41: 237. ♂.

**jennei** Cockerell. Wash.

*Nomada Jennei* Cockerell, 1906. Canad. Ent. 38: 281. ♂.

**martinella** Cockerell. N. Mex., Colo.

*Nomada (Centrias) martinella* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 590. ♀.

Taxonomy: Cockerell, 1905. Colo. Agr. Expt. Sta., Bul. 94: 76. ♀, ♂.

**melliventris** Cresson. Calif.

*Nomada melliventris* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 82. ♂.

**pascoensis** Cockerell. Wash., Calif.

*Nomada (Xanthidium) pascoensis* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 564. ♂.

**rohweri aureopilosa** Swenk. Colo.

*Nomada (Micronomada) aureopilosa* Swenk, 1913. Nebr. Univ., Studies 12: 111. ♀.

Taxonomy: Swenk, 1915. Nebr. Univ., Studies 15: 32.

**rohweri rohweri** Cockerell. Colo.

*Nomada rohweri* Cockerell, 1906. Amer. Mus. Nat. Hist., Bul. 22: 438. ♀, ♂.

**rubicunda** Olivier. Minn. to N. Y., south to Fla.

*Nomada rubicunda* Olivier, 1811. Encycl. Meth., v. 8, p. 365.

*Nomada torrida* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 250. ♀.

**scita** Cresson. Colo., Nebr., N. Dak.

*Nomada scita* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 77. ♂.

Taxonomy: Swenk, 1915. Nebr. Univ., Studies 15: 181. ♀, ♂.

**scitiformis** Cockerell. Oreg.*Nomada (Centrias) scitiformis* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 591. ♂.**semiscita** Cockerell. Colo.*Nomada semiscita* Cockerell, 1904. Ann. and Mag. Nat. Hist. (7) 14: 28. ♂.**seneciophila** Mitchell. N. C., Fla.*Nomada (Nomadula) seneciophila* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 370. ♀, ♂.**sophiarum** Cockerell. N. Mex.*Nomada sophiarum* Cockerell, 1903. Ann. and Mag. Nat. Hist. (7) 12: 213. ♂.**Genus HEXEPEOLUS** Linsley and Michener*Herepeolus* Linsley and Michener, 1937. Pan-Pacific Ent. 13: 77.Type-species: *Herepeolus mojavensis* Linsley and Michener. Orig. desig.

Revision: Linsley and Michener, 1939. Amer. Ent. Soc., Trans. 65: 287-289. —Michener, 1944.

Amer. Mus. Nat. Hist., Bul. 82: 274.

**mojavensis** Linsley and Michener. Calif.*Herepeolus mojavensis* Linsley and Michener, 1937. Pan-Pacific Ent. 13: 78. ♀, ♂.**rhodogyne** Linsley and Michener. Calif. Host: *Ancylandrena larreae* Timb.?*Herepeolus rhodogyne* Linsley and Michener, 1937. Pan-Pacific Ent. 13: 80. ♀, ♂.**Genus PARANOMADA** Linsley and Michener*Paranomada* Linsley and Michener, 1937. Pan-Pacific Ent. 13: 82.Type-species: *Paranomada nitida* Linsley and Michener. Monotypic and orig. desig.The species of this genus may be cleptoparasites in the nests of *Exomalopsis*.

Revision: Linsley and Michener, 1939. Amer. Ent. Soc., Trans. 65: 289-291 (genera).

—Linsley, 1943. Amer. Ent. Soc., Trans. 69: 103-104 (species keys). —Michener, 1944.

Amer. Mus. Nat. Hist., Bul. 82: 274 (genera). —Linsley, 1945. Ent. News 56: 149-151 (species keys).

**californica** Linsley. Calif.*Paranomada californica* Linsley, 1945. Ent. News 56: 149. ♀, ♂.**nitida** Linsley and Michener. Ariz.*Paranomada nitida* Linsley and Michener, 1937. Pan-Pacific Ent. 13: 83. ♀.**velutina** Linsley. Ariz.; Mexico (Baja California).*Paranomada velutina* Linsley, 1939. Pan-Pacific Ent. 15: 10. ♂.

Taxonomy: Linsley, 1943. Amer. Ent. Soc., Trans. 69: 105. ♀, ♂.

**Genus HESPERONOMADA** Linsley*Hesperonomada* Linsley, 1939. Pan-Pacific Ent. 15: 5.Type-species: *Hesperonomada melanantha* Linsley. Monotypic and orig. desig.

Revision: Linsley and Michener, 1939. Amer. Ent. Soc., Trans. 65: 291-292.

**melanantha** Linsley. Calif. Host: ?*Exomalopsis* spp.*Hesperonomada melanantha* Linsley, 1939. Pan-Pacific Ent. 15: 6. ♀, ♂.**Genus TRIOPASITES** Linsley*Triopasites* Linsley, 1939. Pan-Pacific Ent. 15: 8.Type-species: *Triopasites timberlakei* Linsley. Monotypic and orig. desig.

Revision: Linsley and Michener, 1939. Amer. Ent. Soc., Trans. 65: 293-294. —Linsley, 1943.

Amer. Ent. Soc., Trans. 69: 99-103.

**laguna** Linsley. Calif.; Mexico (Baja California).*Triopasites laguna* Linsley, 1943. Amer. Ent. Soc., Trans. 69: 102. ♂.**micheneri** Linsley. Ariz.*Triopasites micheneri* Linsley, 1943. Amer. Ent. Soc., Trans. 69: 101. ♀.

- pasitura** (Cockerell). Tex. Host: *Exomalopsis compactula* (Ckll.)?  
*Nomada pasitura* Cockerell, 1935. Amer. Mus. Novitates 766: 6. ♂.  
**penniger** (Cockerell). N. Mex.  
*Nomada penniger* Cockerell, 1894. Ent. News 5: 235. ♀.  
**timberlakei** Linsley. Calif.  
*Triopasites timberlakei* Linsley, 1939. Pan-Pacific Ent. 15: 9. ♀.

#### Genus MELANOMADA Cockerell

- Melanomada* Cockerell, 1903. Acad. Nat. Sci. Phila., Proc. 55: 587.  
 Type-species: *Nomada grindeliae* Cockerell. Monotypic and orig. desig.  
**grindeliae** (Cockerell). Nebr., Mont.  
*Nomada grindeliae* Cockerell, 1903. Ann. and Mag. Nat. Hist. (7) 12: 210. ♂.  
**heleniella** (Cockerell). Tex., Nebr., Kans.  
*Nomada (Melanomada) heleniella* Cockerell, 1911. U. S. Natl. Mus., Proc. 39: 648. ♀, ♂.  
**sidaefloris** (Cockerell). N. Mex.  
*Nomada pennigera* var. *sidaefloris* Cockerell, 1898. N. Mex. Univ., Bul. 1: 59. ♂.

#### SUBFAMILY ANTHOPHORINAE

This is a large assemblage of both pollen-collecting and parasitic bees. It is found on all the continents although it is especially well represented in the Holarctic, Ethiopian and Neotropical regions. The current classification recognizes about a dozen tribes of which seven are represented in America north of Mexico. Insofar as known, all of the pollen-collecting species line their cells with a waxlike substance.

#### TRIBE EXOMALOPSINI

This tribe consists of several American genera which are chiefly or entirely Neotropical in occurrence. Only the genera *Ancyloscelis* and *Exomalopsis* extend northward into the United States. Close relatives of the Exomalopsini include two tribes, the Ancylini (*Ancyla* and *Tarsalia*) which inhabit the more arid areas of the Palearctic and the Tetrapediini (*Tetrapedia*) which live in the tropics of the Neotropical Region. While most of the studied Exomalopsini nest in the ground and are colonial, if not communal, at least some species of the genus *Paratetrapedia*, like the Tetrapediini, make their nests in wood.

Taxonomy: Michener and Moure, 1957. Amer. Mus. Nat. Hist., Bul. 112: 395-452, 91 figs. (generic classification).

Biology: Torchio, 1974. Kans. Ent. Soc., Jour. 47: 54-63, 21 tables (nest architecture, comparative behavior).

#### Genus EXOMALOPSIS Spinola

Although primarily a genus of Neotropical bees, there are several subgenera represented in America north of Mexico, especially in the more arid areas of the southwestern United States. The species of *Paranomada*, *Hesperonomada* and *Triopasites* may be cleptoparasitic in the nests of these bees.

Revision: Timberlake, 1947. N. Y. Ent. Soc., Jour. 55: 85-106. — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 235-240, figs. 68-69 (eastern U. S. spp.).

#### Genus EXOMALOPSIS Subgenus EXOMALOPSIS Spinola

*Exomalopsis* Spinola, 1853. Accad. Sci. Torino, Mem. (2) 13: 89.

Type-species: *Exomalopsis aureopilosa* Spinola. Desig. by Taschenberg, 1883.  
 (= *Exomalopsis fulvipilosa* Spinola).

?*Epimonispractor* Holmberg, 1903. Buenos Aires Mus. Nac. de Hist. Nat., An. (3) 2: 426.

Type-species: *Epimonispractor graciosus* Holmberg. Orig. desig.

**birkmanni** Cockerell. Tex. Pollen: Unknown, but visits flowers of *Antigonon leptopus*.  
*Exomalopsis birkmanni* Cockerell, 1922. Ann. and Mag. Nat. Hist. (9) 10: 265. ♀.

**pulchella** Cresson. Southern Fla.; Cuba.

*Exomalopsis pulchella* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 191. ♀, ♂.

**similis** Cresson. Southern Fla.; Cuba, Jamaica, Costa Rica. Pollen: Polylectic, visits a wide variety of flowers for nectar and pollen including *Antigonum leptopus*, *Borreria laevis*, *Citrus*, *Cleome*, *Cocos nucifera*, *Comelina*, *Kallstroemia*, *Ludwigia*, *Malpighia punicifolia*, *Mimosa pudica*, *Piriqueta cistoides*, *Psidium guajava*, *Rhynchospora nervosa*, *Sida*, *Solanum*, *Stachytarpheta*, *Teliostachya alopecuroides*, *Trimezia*.

*Exomalopsis similis* Cresson, 1865. Ent. Soc. Phila., Proc. 4: 191. ♀.

*Exomalopsis penelope* Cockerell, 1897. Amer. Ent. Soc., Trans. 24: 161. ♀, ♂.

*Exomalopsis ogilviei* Cockerell, 1938. Entomologist 71: 281. ♀.

Taxonomy: Michener, 1954. Amer. Mus. Nat. Hist., Bul. 104: 109 (synonymy).

Biology: Raw, 1977 (1976). Biotropica 8:270-277, 2 figs., 2 tables (seasonal changes in numbers and foraging activities).

**zexmeniae** Cockerell. South. Tex. to Panama. Pollen: Collects pollen from flowers of grasses, composites and Solanaceae.

*Exomalopsis zexmeniae* Cockerell, 1912. Ent. News 23: 447. ♀.

*Exomalopsis azulensis* Cockerell, 1949. U. S. Natl. Mus., Proc. 98: 451. ♀.

Taxonomy: Michener, 1954. Amer. Mus. Nat. Hist., Bul. 104: 108, figs. 62-64 (synonymy, taxonomic characters, floral relationships).

### Genus EXOMALOPSIS Subgenus PHANOMALOPSIS Michener and Moure

*Exomalopsis* subg. *Phanomalopsis* Michener and Moure, 1957. Amer. Mus. Nat. Hist., Bul. 112: 430.

Type-species: *Exomalopsis jenseni* Friese. Orig. design.

**snowi** Cockerell. South. Tex.

*Exomalopsis snowi* Cockerell, 1906. Ann. and Mag. Nat. Hist. (7) 18: 73. ♂.

**solani** Cockerell. Tex., N. Mex., Colo (Pueblo), Ariz.; Mexico (Zacatecas). Pollen: Polylege of a wide variety of flowers including *Acacia*, *Baileya*, *Cassia*, *Chrysothamnus*, *Chilopsis linearis*, *Cleome*, *Croton*, *Eriogonum*, *Flaveria*, *Haplopappus*, *Kallstroemia*, *Larrea*, *Petalostemon*, *Solanum*, *Sphaeralcea*, *Verbesina*.

*Exomalopsis solani* Cockerell, 1896. Canad. Ent. 28: 25. ♀.

Biology: Linsley, MacSwain and Smith, 1954. South. Calif. Acad. Sci., Bul. 55: 83-101.

—Linsley, MacSwain and Smith, 1954. Pan-Pacific Ent. 30: 263-264 (nest). —Michener, 1966. Kans. Ent. Soc., Jour. 39: 315-317 (cooperative nest provisioning). —Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 40 (nest sites, floral relationships).

**solidaginis** Cockerell. N. Mex., Ariz., south. Calif., desert. Pollen: Unknown, but visits flowers of *Gutierrezia lucida*, *Heterotheca*, *Lippia wrightii*, *Solidago canadensis arizonica*.

*Exomalopsis solidaginis* Cockerell, 1898. Ann. and Mag. Nat. Hist. (7) 2: 452. ♂.

*Exomalopsis verbesinae* Cockerell, 1904. Ann. and Mag. Nat. Hist. (7) 14: 21. ♀.

Taxonomy: Cockerell, 1907. Ann. and Mag. Nat. Hist. (7) 19: 539. ♀, ♂.

### Genus EXOMALOPSIS Subgenus ANTHOPHORULA Cockerell

*Anthophorula* Cockerell, 1897. N. Mex. Agr. Expt. Sta., Bul. 24: 44.

Type-species: *Anthophorula compactula* Cockerell. Monotypic.

*Diadasiella* Ashmead, 1899. Amer. Ent. Soc., Trans. 26: 64.

Type-species: *Synhalonia albicans* Provancher. Monotypic and orig. design.  
(= *Diadasiella coquilleti* Ashmead).

*Exomalopsis* subg. *Pachycerapis* Cockerell, 1922. Amer. Mus. Novitates 47: 4.

Type-species: *Exomalopsis cornigera* Cockerell. Orig. design.

**albata** Timberlake. Utah., Ariz., south. Calif., desert. Pollen: Unknown, but visits flowers of *Eriogonum fasciculatum*, *E. reniforme*, *E. trichopes*, *Gutierrezia lucida*.

*Exomalopsis (Anthophorula) albata* Timberlake, 1947. N. Y. Ent. Soc., Jour. 55: 92. ♀, ♂.



- albicans** (Provancher). Oreg., Calif. Pollen: Unknown, but visits flowers of *Brassica campestris*, *B. incana*, *Cryptantha intermedia*, *Eriastrum*, *Eriogonum fasciculatum*, *Euphorbia*, *Eschscholzia californica*, *Stephanomeria virgata*, *Trichostema lanceolatum*. *Synhalonia albicans* Provancher, 1896. Nat. Canad. 23: 27. ♂.  
*Diadasiella coquilletti* Ashmead, 1899. Amer. Ent. Soc., Trans. 26: 64. ♂.
- albovestita** Timberlake. South. Calif., desert. Pollen: Unknown, but visits flowers of *Cryptantha barbiger*, *Dalea emoryi*, *Eriogonum trichopes*, *Petalonyx thurberi*. *Exomalopsis* (*Anthophorula*) *albovestita* Timberlake, 1947. N. Y. Ent. Soc., Jour. 55: 98. ♂.
- cerei** Timberlake. South. Calif. Pollen: Unknown, but visits flowers of *Cereus engelmanni*. *Exomalopsis* (*Anthophorula*) *cerei* Timberlake, 1947. N. Y. Ent. Soc., Jour. 55: 100. ♀.
- compactula** (Cockerell). Tex., N. Mex., Ariz. Parasite: *Triopasites pasitura* (Ckll.)? Pollen: Unknown, but visits flowers of *Aplopappus spinulosus*, *Convolvulus hermannioides*, *Dithyrea wislizenii*, *Grindelia*, *Phacelia congesta*, *Verbesina*. *Anthophorula compactula* Cockerell, 1897. N. Mex. Agr. Expt. Sta., Bul. 24: 44. ♀.
- Taxonomy: Cockerell, 1898. Ann. and Mag. Nat. Hist. (7) 2: 415. ♀, ♂.
- completa** Cockerell. Tex., N. Mex. Pollen: Unknown, but visits flowers of *Convolvulus hermannioides*, *Phacelia congesta*. *Exomalopsis* (*Anthophorula*) *compactula* var. *completa* Cockerell, 1935. Amer. Mus. Novitates 766: 5. ♀, ♂.
- cornigera** Cockerell. Ariz.  
*Exomalopsis* (*Pachycerapis*) *cornigera* Cockerell, 1922. Amer. Mus. Novitates 47: 5. ♂.
- deserticola** Timberlake. South. Calif., desert. Pollen: Unknown, but visits flowers of *Asclepias erosa*, *Chilopsis linearis*, *Cleomella obtusifolia*, *Eriogonum reniforme*, *Heliotropium spathulatum*. *Exomalopsis* (*Anthophorula*) *deserticola* Timberlake, 1947. N. Y. Ent. Soc., Jour. 55: 95. ♀, ♂.
- erigoni** Timberlake. South. Calif., deserts. Pollen: Unknown, but visits flowers of *Cleomella obtusifolia*, *Eriogonum reniforme*, *E. trichopes*, *Heliotropium spathulatum*, *Hugelia virgata*, *Pectis papposa*. *Exomalopsis* (*Anthophorula*) *erigoni* Timberlake, 1947. N. Y. Ent. Soc., Jour. 55: 94. ♀, ♂.
- euphorbiae** Timberlake. Ariz., Calif. Pollen: Unknown, but visits flowers of *Boerhaavia*, *Euphorbia*. *Exomalopsis* (*Anthophorula*) *euphorbiae* Timberlake, 1947. N. Y. Ent. Soc., Jour. 55: 102. ♀, ♂.
- gutierreziae** Timberlake. Ariz. Pollen: Unknown, but visits flowers of *Gutierrezia*. *Exomalopsis* (*Anthophorula*) *gutierreziae* Timberlake, 1947. N. Y. Ent. Soc., Jour. 55: 97. ♀.
- palmarum** Timberlake. South. Calif. Pollen: Unknown, but visits flowers of *Eriogonum inflatum*. *Exomalopsis* (*Anthophorula*) *palmarum* Timberlake, 1947. N. Y. Ent. Soc., Jour. 55: 99. ♂.
- rufiventris** Timberlake. West. Tex., Ariz. Pollen: Unknown, but visits flowers of *Boerhaavia*, *Tidestromia lanuginosa*. *Exomalopsis* (*Anthophorula*) *rufiventris* Timberlake, 1947. N. Y. Ent. Soc., Jour. 55: 101. ♀, ♂.
- torticornis** Cockerell. South. Calif. Pollen: Collects pollen from flowers of *Hugelia virgata*, but also visits flowers of *Calochortus kennedyi*, *Centaurea melitensis*, *Chaenactis glabriuscula*, *Chorizanthe parryi*, *Convolvulus arvensis*, *Cryptantha intermedia*, *Encelia farinosa*, *Eriogonum fasciculatum* polifolii, *Eschscholzia californica*, *Gutierrezia californica*, *Hemizonia tenella*, *Lotus scoparius*, *L. strigosus*, *Marrubium vulgare*, *Mentzelia lindleyi*, *Navarretia intertexta*, *Opuntia vaseyi*, *Sphaeralcea ambigua*. *Exomalopsis torticornis* Cockerell, 1927. Ent. Soc. Amer., Ann. 20: 399. ♂.
- Biology: Hicks, 1936. Canad. Ent. 68: 47 (nest).
- varleyi** Timberlake. South. Calif., desert (Warren's Well). *Exomalopsis* (*Anthophorula*) *varleyi* Timberlake, 1947. N. Y. Ent. Soc., Jour. 55: 96. ♂.

## Genus EXOMALOPSIS Subgenus ANTHOPHORISCA Michener and Moure

*Exomalopsis* subg. *Anthophoriscia* Michener and Moure, 1957. Amer. Mus. Nat. Hist., Bul. 112: 433.

Type-species: *Melissodes pygmaea* Cresson. Orig. desig.

*asteris* Mitchell. Tex., Ind. Pollen: Unknown, but visits flowers of *Aster*.

*Exomalopsis (Anthophoriscia) asteris* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 236, fig. 68. ♀, ♂.

*chionura* Cockerell. Cent. Calif. Pollen: Stores pollen of *Grindelia camporum*.

*Exomalopsis (Anthophorula) chionura* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 203. ♀, ♂.

Taxonomy: Rozen, 1957. Ent. Soc. Amer., Ann. 50: 469-475 (larva).

Biology: Rozen and MacNeill, 1957. Ent. Soc. Amer., Ann. 50: 522-529 (nest, life history).

*chlorina* Cockerell. N. Mex. Pollen: Unknown, but visits flowers of *Sphaeralcea*.

*Exomalopsis chlorina* Cockerell, 1918. Ann. and Mag. Nat. Hist. (9) 2: 477. ♀.

*micheneri* Timberlake. Miss. Pollen: Unknown, but visits flowers of *Gerardia*.

*Exomalopsis (Anthophorula) micheneri* Timberlake, 1947. N. Y. Ent. Soc., Jour. 55: 105. ♀, ♂.

*morgani* (Cockerell). Tex. Pollen: Unknown, but visits flowers of *Helianthus*.

*Anthophorula morgani* Cockerell, 1914. Entomologist 47: 114. ♀.

*nitens* Cockerell. South. Calif. Pollen: Unknown, but visits flowers of *Aster*, *Calochortus splendens*, *Calycaenia multiglandulosa*, *Chlorogalum parviflorum*, *Brodiaea crocea*, *B. isoioides*, *Grindelia camporum*, *G. rubriflorum*, *Hemizonia fasciculata*, *Lessingia germanorum*, *Lotus scoparius*, *Malacothamnus arcuatus*, *Malvastrum fasciculatum*, *Navarretia heterodoxa*, *Opuntia littoralis*, *O. parryi*.

*Exomalopsis nitens* Cockerell, 1915. Pomona Col. Jour. Ent. Zool. 7: 231. ♀.

*pygmaea* (Cresson). Nebr., Colo., Tex. Pollen: Unknown, but visits flowers of *Helianthus annuus*.

*Melissodes pygmaea* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 279. ♀.

*Exomalopsis Bruneri* Crawford, 1902. Canad. Ent. 34: 238. ♀, ♂.

Biology: Schwarz, 1896. Ent. Soc. Wash., Proc. 4: 24-26 (sleeping habits).

*sidae* Cockerell. Tex., N. Mex., Ariz., South. Calif., Mexico (Baja California). Pollen: Apparently an oligolege of the Malvaceae, visiting flowers of *Sida hederacea*, *Sphaeralcea*.

Predator: *Philanthus arizonicus* Bohart.

*Exomalopsis sidea* Cockerell, 1897. Amer. Ent. Soc., Trans. 24: 160. ♀, ♂.

*texana* Friese. Tex. Pollen: Unknown, but visits flowers of *Helenium tenuifolium*.

*Exomalopsis texana* Friese, 1899. K. K. Naturhist. Hofmus., Ann. 14: 264. ♀, ♂.

## Genus ANCYLOSCELIS Latreille

*Ancyloscelis* Latreille, 1829. In Cuvier, Le Regne Animal, ed. 2, v. 5, p. 355.

Type-species: *Ancylosceles ursinus* Haliday. First included species.

*Ancylosceles* (!) Haliday, 1837. Linn. Soc. London, Trans. 17: 320.

*Dipedia* Friese, 1906. Flora og Fauna, v. 8, p. 92.

Type-species: *Ancyloscelis armatus* Smith. Desig. by Lutz and Cockerell, 1920 (= *Chalcis apiformis* Fabricius).

All species visit flowers of *Ipomoea* for pollen and nectar, but also visit flowers of other plants for nectar.

Revision: Michener, 1942. Pan-Pacific Ent. 18: 108-113.

*apiformis* (Fabricius). Brazil to Tex. Parasite: *Anthrax limatulus* Say, *Monodontomerus mexicanus* Gahan, *Trophocleptia schraderi* Mich.?

*Chalcis apiformis* Fabricius, 1793. Ent. System., p. 195. ♂.

*Ancyloscelis armatus* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 367. ♂.

*Nomia tarsalis* Westwood, 1875. Ent. Soc. London, Trans. p. 221, pl. 5, fig. 5.

*Melissodes toluca* Cresson, 1878. Acad. Nat. Sci. Phila., Proc., p. 219. ♀ (♂ misdet.).

*Exomalopsis chionocincta* Cockerell, 1949. U. S. Natl. Mus., Proc. 98: 453. ♀.

Taxonomy: Cockerell, 1905. Amer. Ent. Soc., Trans. 31: 325. — Michener, 1954. Amer. Mus. Nat. Hist., Bul. 104: 110, figs. 50-52 (synonymy, characters). — Moure, 1960. Studia Ent. 3: 114-115 (synonymy, notes on type).

Biology: Michener, 1974. Kans. Ent. Soc., Jour. 47: 19-22, 4 figs. (nest architecture, nests intermingled with nests of *Melitoma ?euglossoides*; reported as *?armatus*). — Torchio, 1974. Kans. Ent. Soc., Jour. 47: 54-63, 2 tables (nest architecture, nests intermingled with nests of *Melitoma ?euglossoides*, life history, associates; reported as *?armatus*).

**sejunctus** Cockerell. Tex., Colo., Ariz.

*Ancylosceles sejunctus* Cockerell, 1933. Amer. Mus. Novitates 595: 1. ♂.

*Ancylosceles maculifera* Cockerell, 1934. Amer. Mus. Novitates 697: 8. ♂.

Taxonomy: Cockerell, 1935. Amer. Mus. Novitates 766: 4. ♀.

### TRIBE MELITOMINI

This tribe is found only in the New World and is represented in America north of Mexico by the genera *Diadasia*, *Melitoma* and *Ptilothrix*. Although species of these genera occupy both continents, only the genus *Diadasia* contains numerous species in the more arid parts of North and South America. As a group the Melitomini have established a specialized dependency upon the pollens of a limited number of plant families including notably only certain genera in the Cactaceae, Compositae, Convolvulaceae, Malvaceae and Onagraceae.

Taxonomy: Michener, 1954. Amer. Mus. Nat. Hist., Bul. 104: 128 (generic classification).

Biology: Linsley, MacSwain and Smith, 1956. South. Calif. Acad. Sci., Bul. 55: 83-101, pl. 26 (biological characters). — Linsley and MacSwain, 1952. Calif. Univ. Pubs. Ent. 9: 267-290, pls. 1-6 (biological relationships with Anthophorini).

### Genus PTILOTHRIX Smith

*Ptilothrix* Smith, 1853. Cat. Hym. Brit. Mus., v. 1, p. 131.

Type-species: *Ptilothrix plumatus* Smith. Monotypic.

*Ptilothrix* Marschall, 1873. Nomenclator Zoologicus, p. 269. Emend.

*Emphor* Patton, 1879. U. S. Geol. Geog. Survey, Bul. 5: 476.

Type-species: *Melissodes bombiformis* Cresson. Monotypic and orig. desig.

*Energoponus* Holmberg, 1903. Mus. Nac. Buenos Aires, An. (3) 2: 406.

Type-species: *Ptilothrix plumatus* Smith. Desig. by Sandhouse, 1943.

(=*Energoponus strenuus* Holmberg).

Taxonomy: Moure, 1947. Soc. Ent. Argentina, Rev. 13: 24 (synonymy).

**bombiformis** (Cresson). Kans. and Ill. to N. J., south to Tex. and Fla.; Mexico. Pollen: Stores pollen of *Hibiscus*, but also visits flowers of *Althaea*, *Cephalanthus*, *Cirsium*, *Ipomoea*, *Verbena*, *Vernonia* for nectar.

*Melissodes bombiformis* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 219. ♀, ♂.

*Emphor fuscojubatus* Cockerell, 1913. Psyche 20: 107. ♀.

Taxonomy: Michener, 1953. Kans. Univ. Sci. Bul. 35: 1075, figs. 212-218 (larva). — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 240-242, fig. 67 (synonymy, redescription).

Biology: Robertson, 1890. Canad. Ent. 22: 217. — Knab, 1911. Ent. Soc. Wash., Proc. 13: 170. — Grossbeck, 1911. N. Y. Ent. Soc., Jour. 19: 238. — Nichols, 1913. Psyche 20: 107 (as *fuscojubatus*). — Robertson, 1914. Ent. News 25: 70. — Robertson, 1918. Canad. Ent. 50: 320. — Robertson, 1925. Psyche 32: 278. — Davis, 1926. Brooklyn Ent. Soc., Bul. 21: 127. — Rau, 1930. Brooklyn Ent. Soc., Bul. 25: 28. — Rau, 1934. Acad. Sci. St. Louis, Trans. 28: 222. — Michener, 1947. Amer. Midland Nat. 38: 451 (habits).

**sumichrasti** (Cresson). Ariz. (Marana and Sahuarita); Mexico. Parasite: *Dasymutilla connectens* (Cameron)?, *D. eminentia* Mickel?, *D. foxi* (Ckll.)?, *D. phoenix* (Fox)?, *Lytta variabilis* Duges, *Nemognatha chrysomeloides* L., *Pseudomethoca praeclara* (Blake)?, Pollen: Stores pollen of *Gossypium* (cultivated), *Ipomoea longifolia*, *I. pringlei*,

*Kallstroemia grandiflora*, but visits other flowers like *Tribulus terrestris* presumably for nectar.

*Melissodes sumichrasti* Cresson, 1878. Acad. Nat. Sci. Phila., Proc., p. 218. ♀, ♂.

Biology: Linsley, MacSwain and Smith, 1956. South. Calif. Acad. Sci., Bul. 55: 83-101, pl. 26, figs. 5, 10 (nest, larva, life history). — Butler, 1967. Pan-Pacific Ent. 43: 8-14 (nest, life history). — Cazier and Linsley, 1974. Amer. Mus. Novitates 2546: 13 (nest site, floral relationships).

### Genus DIADASIA Patton

*Diadasia* Patton, 1879. U. S. Geol. Geog. Survey, Bul. 5: 475.

Type-species: *Melissodes enavata* Cresson. Orig. desig.

*Dasiapis* Cockerell, 1903. Ann. and Mag. Nat. Hist. (7) 12: 450.

Type-species: *Dasiapis ochracea* Cockerell. Monotypic.

*Leptomertia* Holmberg, 1903. Mus. Nac. Buenos Aires, An. (3) 2: 409.

Type-species: *Leptomertia pereyrae* Holmberg. Desig. by Brethes, 1910.

*Coquillettapis* Viereck, 1909. Ent. Soc. Wash., Proc. 11: 47.

Type-species: *Melissodes nigrifrons* Cresson. Monotypic and orig. desig.  
(=*Coquillettapis melittoides* Viereck).

*Diadasina* Moure, 1950. Dusenian 1: 392.

Type-species: *Melitoma paraensis* Ducke. Orig. desig.

*Diadasiana*(!) Michener, 1954. Amer. Mus. Nat. Hist., Bul. 104: 129.

Bees of this genus occur only in the Americas and are distributed chiefly in the warm temperate areas of North and South America, although a few species are present in the moist tropics. The species are oligolectic, obtaining pollen primarily from the Malvaceae (*Callirhoe*, *Sida*, *Sidalcea*, *Sphaeralcea*), Convolvulaceae (*Calystegia*, *Convolvulus*), Compositae (*Helianthus*), Cactaceae (*Opuntia*) and the Onagraceae (*Clarkia*). The known parasites include species of the family Bombyliidae (*Anthrax*, *Villa*), Meloidae (*Lytta*, *Tetraonyx*), Mutillidae (*Dasymutilla*, *Sphaerophthalma*), and Rhipiphoridae (*Rhipiphorus*). The bee genus *Protepeolus* is a cleptoparasite of at least one species of *Diadasia*.

Revision: Cockerell, 1905. Amer. Nat. 39: 741-743. — Timberlake, 1941. Brooklyn Ent. Soc., Bul. 36: 2-11 (key).

Taxonomy: Michener, 1954. Amer. Mus. Nat. Hist., Bul. 104: 129-131, table 2 (synonymy, subgeneric characters).

Biology: Lutz and Cockerell, 1920. Amer. Mus. Nat. Hist., Bul. 42: 583-587 (floral and seasonal records). — Linsley and MacSwain, 1957. Wasmann Jour. Biol. 15: 199-235, 2 pls., 2 tables (nesting habits, nest architecture, floral relationships, parasites). — Linsley and MacSwain, 1958. Evolution 12: 219-223 (floral constancy). — Schlissing, 1970. Ecology 51: 1061-1067 (sequence and timing of foraging). — Cazier and Linsley, 1974. Amer. Mus. Novitates 2546: 14 (floral relationships). — Eickwort, Eickwort and Linsley, 1977. Kans. Ent. Soc., Jour. 50: 1-17, 9 figs., 3 tables (nest aggregations).

**afflicta afflicta** (Cresson). N. Mex., Tex. Pollen: Collects pollen from flowers of *Callirhoe*.

*Melissodes afflicta* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 217. ♀, ♂.

Biology: Snyder, Barrows and Chabot, 1976. Kans. Ent. Soc., Jour. 49: 200-203, 2 figs. (nest architecture, pollen mass, insertion of egg).

**afflicta perafflicta** Cockerell. Kans. Pollen: Collects pollen from flowers of *Callirhoe*.

*Diadasia afflicta perafflicta* Cockerell, 1905. Amer. Nat. 39: 744. ♂, ♀.

**afflictula** Cockerell. N. Mex.

*Diadasia afflictula* Cockerell, 1910. Ann. and Mag. Nat. Hist. (8) 5: 366. ♂.

**albovestita** Provancher. Calif.

*Diadasia albovestita* Provancher, 1896. Nat. Canad. 23: 27. ♀.

*Didasia*(!) *alboresta*(!) Fowler, 1899. Canad. Ent. 31: 285.

**angusticeps** Timberlake. Calif. Pollen: Collects pollen from flowers of *Clarkia*.

*Diadasia angusticeps* Timberlake, 1939. Brooklyn Ent. Soc., Bul. 34: 15. ♂, ♀.

Biology: Linsley and MacSwain, 1957. Wasmann Jour. Biol. 15: 201 (flower relationships).

—MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 70: 26-29 (flower relationships).

**australis australis** (Cresson). Colo., N. Mex., Tex., Ariz. Pollen: Collects pollen from flowers of *Opuntia*.

*Melissodes australis* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 214. ♀, ♂.

**australis californica** Timberlake. Calif., Colo., N. Mex., Calif.; Mexico (Zacatecas). Pollen: Collects pollen from flowers of Cactaceae, principally *Opuntia*. Other subspecies of *australis* are known from Mexico.

*Diadasia australis californica* Timberlake, 1940. Brooklyn Ent. Soc., Bul. 35: 28. ♀, ♂.

Biology: Linsley and MacSwain, 1957. Wasmann Jour. Biol. 15: 201-203.

**bituberculata** (Cresson). Calif. Parasite: *Lytta melaena* (LeC.), *Rhipiphorus diadasiae* Linsley and MacSwain, *Sphaerophthalma auraria* (Blake), *S. unicolor* (Cress.), *Villa apicola* Cole, *V. triculata* Cole. Pollen: Collects pollen from flowers of the introduced *Convolvulus arvensis* as well as from the native species of *Calystegia* and *Convolvulus*.

*Melissodes bituberculata* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 218. ♂.

*Didasia (!) cinerea* Fowler, 1899. Canad. Ent. 31: 285. ♂.

Biology: Linsley and MacSwain, 1952. Pan-Pacific Ent. 28: 131-135. —Linsley and MacSwain, 1957. Wasmann Jour. Biol. 15: 203. —Schlising, 1972. Pan-Pacific Ent. 48: 175-188, 1 fig., 3 tables (foraging and nest provisioning behavior).

**consociata** Timberlake. Calif., Nev., Ariz. Parasite: *Anthrax nidicola* Cole, *Rhipiphorus dammersi* Barber, *R. smithi* Linsley and MacSwain, *Villa apicola* Cole. Pollen: Collects pollen principally from flowers of *Sida* and may also collect pollen from flowers of *Sphaeralcea*.

*Diadasia consociata* Timberlake, 1939. Brooklyn Ent. Soc., Bul. 34: 11. ♂, ♀.

Biology: Linsley, MacSwain and Smith, 1952. Calif. Univ. Pubs. Ent. 9: 267-290, 6 pls.

(bionomics). —Linsley and MacSwain, 1957. Wasmann Jour. Biol. 15: 203, 205, pl. 1, fig. 1 (nesting habits, flower relationships, parasites).

**diminuta** (Cresson). B. C. to Calif., east to Nebr., Kans. and Tex.; Mexico. Ecology: Nests are sometimes usurped by *Osmia seclusa* Sandhouse. Parasite: *Dasymutilla foxi* (Ckll.), *Rhipiphorus serdens* Linsley and MacSwain, *Villa perplexa* (Coq.). Pollen: Collects pollen from flowers of *Sphaeralcea* and *Kallstroemia grandiflora*.

*Melissodes diminuta* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 215. ♂.

*Melissodes apache* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 217. ♀.

Biology: Bohart, 1955. Ent. Soc. Wash., Proc. 57:235-236 (nest usurpation). —Linsley and MacSwain, 1957. Wasmann Jour. Biol. 15: 205-211, pl. 2. (nesting habits, flower relationships, parasites). —Eickwort, Eickwort and Linsley, 1977. Kans. Ent. Soc., Jour. 50:1-17, 9 figs., 3 tables (nest aggregation, life history).

**enavata** (Cresson). Kans., Colo., N. Mex., Tex., Utah, Ariz., Calif.; Mexico. Parasite: *Anthrax nidicola* Cole, *Dasymutilla fulvohirta* (Cress.). Pollen: Collects pollen from flowers of Compositae, principally those of *Helianthus*. *Diadasia tricineta* listed in synonymy below is almost certainly a synonym of *Synhalonia actiosa* (Cress.), see Timberlake, 1969. Calif. Univ. Pubs. Ent. 57: 13.

*Melissodes enavata* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 280. ♀.

*Melissodes fursina* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 281. ♂.

*Melissodes densa* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 282. ♂.

*Eucera arctos* Dalla Torre, 1896. Cat. Hym., v. 10, p. 225. Proposed to replace *ursina*, preoccupied in *Eucera* in Dalla Torre's sense.

! *Diadasia 3-cincta* Provancher, 1896. Nat. Canad. 23: 28. ♀.

! *Diadasia tricineta* Fowler, 1899. Canad. Ent. 31: 286. Emend.

Taxonomy: Michener, 1953. Kans. Univ. Sci. Bul. 35: 1075, figs. 206-211 (larva).

Biology: Linsley and MacSwain, 1957. Wasmann Jour. Biol. 15: 212, pl. 1, fig. 5 (nesting habits, flower relationships, parasites).

**friesei** Cockerell. ?Calif., Ariz.

*Diadasia friesei* Cockerell, 1898. Amer. Ent. Soc., Trans. 25: 192. ♀.

**laticauda** Cockerell. Calif. Pollen: Collects pollen from flowers of *Malvastrum* and *Sphaeralcea*.

*Diadasia laticauda* Cockerell, 1905. South. Calif. Acad. Sci., Bul. 4: 103. ♀.

*Diadasia crassicauda* Cockerell, 1915. Pomona Jour. Ent. Zool. 7: 231. ♂.

Biology: Linsley and MacSwain, 1957. Wasmann Jour. Biol. 15: 219 (floral relationships).

**lutzi deserticola** Timberlake. Calif. (Chocolate Mts.). Pollen: Collects pollen from flowers of *Sphaeralcea*.

*Diadasia lutzi deserticola* Timberlake, 1940. Brooklyn Ent. Soc., Bul. 35: 23. ♂, ♀.

**lutzi difficilis** Timberlake. Ariz., Calif.; Mexico (Baja California). Pollen: Collects pollen from flowers of *Sphaeralcea*.

*Diadasia lutzi difficilis* Timberlake, 1940. Brooklyn Ent. Soc., Bul. 35: 22. ♂, ♀.

**lutzi lutzi** Cockerell. Wyo., N. Mex., Ariz., Calif.; Mexico (Baja California). Pollen: Collects pollen from flowers of *Sphaeralcea*.

*Diadasia lutzi* Cockerell, 1924. Amer. Mus. Novitates 113: 2. ♂, ♀.

Biology: Linsley and MacSwain, 1957. Wasmann Jour. Biol. 15: 212-213, pl. 1, fig. 3 (nesting habits, flower relationships).

**martialis** Timberlake. South. Calif., Ariz.; Mexico (Baja California). Pollen: Collects pollen from flowers of *Sphaeralcea*.

*Diadasia martialis* Timberlake, 1940. Brooklyn Ent. Soc., Bul. 35: 25. ♂, ♀.

**megamorpha** Cockerell. N. Mex. Pollen: Collects pollen from flowers of *Sphaeralcea* and *Kallstroemia grandiflora*.

*Diadasia megamorpha* Cockerell, 1898. Amer. Ent. Soc., Trans. 25: 192. ♂, ♀.

**nigrifrons** (Cresson). Idaho, Calif. Pollen: Collects pollen from flowers of *Sidalcea*.

*Melissodes nigrifrons* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 195. ♀.

*Diadasia* (!) *nerae* Fowler, 1899. Canad. Ent. 31: 285. ♀, ♂.

*Coquillettapis melittoides* Viereck, 1909. Ent. Soc. Wash., Proc. 11: 48. ♀.

*Diadasia nigrifrons* var. *epileuca* Cockerell, 1925. Calif. Acad. Sci., Proc. (4) 14: 203. ♀.

Biology: Linsley and MacSwain, 1957. Wasmann Jour. Biol. 15: 215.

**nitidifrons** Cockerell. Wash., Calif., Utah. Pollen: Collects pollen from flowers of *Sphaeralcea*.

*Diadasia nitidifrons* Cockerell, 1905. South. Calif. Acad. Sci., Proc. 4: 104. ♂.

*Diadasia skinneri* Cockerell, 1909. Ent. News 20: 206. ♂.

Taxonomy: Michener, 1947. Ann. and Mag. Nat. Hist. (10) 19: 403. ♀.

Biology: Linsley and MacSwain, 1957. Wasmann Jour. Biol. 15: 215.

**ochracea** (Cockerell). Wash., Calif., Ariz., Colo., N. Mex., Tex.; Mexico (Zacatecas). Parasite:

*Protepeolus singularis* Linsley and Michener, *Rhipiphorus sexdens* Linsley and MacSwain, *Sparnoptilus brevicornis* Loew. Pollen: Collects pollen from flowers of *Sphaeralcea* and *Kallstroemia grandiflora*. *Diadasia olivacea* (Cresson, 1878. Acad. Nat. Sci., Phila., Proc. 30: 216), described from Mexico, may be a senior synonym according to Timberlake (1957). In Linsley and MacSwain, Wasmann Jour. Biol. 15:215; however, Krombein (1967. U. S. Dept. Agr., Agr. Monog. 2, suppl. 2: 502) deletes the species from the fauna of America north of Mexico. The type of *D. olivacea* was collected by Sumichrast who made his collections of Hymenoptera in the environs of Orizaba and Cordoba (see Cresson, 1868. Amer. Ent. Soc., Trans. 2: 1). This is well to the south of the known southernmost occurrence (Zacatecas) of *D. ochracea*. The types of *D. olivacea* and *D. ochracea*, both males, must be reexamined in order to determine the validity of the proposed synonymy.

*Dasiaapis ochracea* Cockerell, 1903. Ann. and Mag. Nat. Hist. (7) 12: 450. ♂.

*Diadasia blaisdelli* Cockerell, 1924. Pan-Pacific Ent. 1: 54. ♀.

Biology: Linsley and MacSwain, 1957. Wasmann Jour. Biol. 15: 215-217, pl. 1, fig. 4.

—Eickwort, Eickwort and Linsley, 1977. Kans. Ent. Soc., Jour. 50:1-17, 9 figs., 1 table (nest aggregations, nest architecture, life history, parasites, as *olivacea*).

**opuntiae** Cockerell. Coastal south. Calif. Pollen: Collects pollen from flowers of *Opuntia*.

*Diadasia rinconis opuntiae* Cockerell, 1901. Canad. Ent. 33: 286. ♀.

- palmarum** Timberlake. South. Calif. desert. Pollen: Collects pollen from flowers of *Sphaeralcea*.  
*Diadasia palmarum* Timberlake, 1940. Brooklyn Ent. Soc., Bul. 35: 27. ♂, ♀.
- piercei** Cockerell. Tex., Ariz.  
*Diadasia piercei* Cockerell, 1911. Canad. Ent. 43: 132. ♂, ♀.
- rinconis mimetica** Cockerell. Calif. (isl. off coast). Pollen: Collects pollen from flowers of *Opuntia*. Another subspecies (*petrina*) is known from Baja California.  
*Diadasia australis mimetica* Cockerell, 1924. Pan-Pacific Ent. 1: 53. ♀.
- rinconis rinconis** Cockerell. Tex., N. Mex., Ariz., Calif.; Mexico (Baja California). Pollen: Collects pollen from flowers of *Opuntia*.  
*Diadasia rinconis* Cockerell, 1897. Amer. Ent. Soc., Trans. 24: 154. ♀.  
*Diadasia rinconis*(!) Snow, 1906. Kans. Acad. Sci., Trans. 20: 137.
- sphaeralcearum affinis** Timberlake. Tex. to south. Calif. and Nev. Pollen: Collects pollen from flowers of *Sphaeralcea*.  
*Diadasia sphaeralcearum affinis* Timberlake, 1939. Brooklyn Ent. Soc., Bul. 34: 14. ♂, ♀.
- sphaeralcearum sphaeralcearum** Cockerell. N. Mex., Ariz. Pollen: Collects pollen from flowers of *Sphaeralcea*.  
*Diadasia sphaeralcearum* Cockerell, 1905. Amer. Nat. 39: 744. ♂.
- Taxonomy: Michener, 1937. Ann. and Mag. Nat. Hist. (10) 19: 403. ♀.
- tuberculifrons** Timberlake. Ariz., Calif., Nev. Pollen: Collects pollen from flowers of *Sphaeralcea*.  
*Diadasia tuberculifrons* Timberlake, 1939. Brooklyn Ent. Soc., Bul. 34: 13. ♂, ♀.
- vallicola** Timberlake. Ariz., Calif.; Mexico (Baja California). Parasite: *Rhipiphorus diadasiae* Linsley and MacSwain, *Sphaerophthalma blakei* Fox, *Villa* sp. near *flavipilosa* Cole.  
Pollen: Collects pollen from flowers of *Sphaeralcea*.  
*Diadasia vallicola* Timberlake, 1940. Brooklyn Ent. Soc., Bul. 35: 24. ♂.
- Biology: Hall and Hurd In Linsley and MacSwain, 1957. Wasmann Jour. Biol. 15: 217-218 (nest, parasites).
- vestita** Timberlake. N. Mex. (Rio Puerco in Bernalillo Co.).  
*Diadasia vestita* Timberlake, 1956. Pan-Pacific Ent. 32: 91. ♂.

### Genus MELITOMA Lepeletier and Serville

- Melitoma* Lepeletier and Serville, 1828. Encycl. Meth., Hist. Nat. Ins., v. 10, p. 529.  
Type-species: *Melitoma euglossoides* Lepeletier and Serville. Monotypic.
- Entechnia* Patton, 1879. U. S. Geol. and Geog. Survey, Bul. 5: 476.  
Type-species: *Anthophora taurea* Say. Monotypic and orig. desig.
- Meliphila* Schrottky, 1902. Buenos Aires Mus. Nac. de Hist. Nat. An. 7: 310.  
Type-species: *Apis segmentaria* Fabricius. Monotypic and orig. desig. (= *Meliphila ipomoeae* Schrottky and *Melitoma euglossoides* Lepeletier and Serville).
- All species visit flowers of *Ipomoea* for pollen and nectar, but also visit a wide variety of other flowers for nectar.
- grisella** (Cockerell and Porter). N. Dak., Nebr., Kans., Colo., N. Mex.  
*Entechnia grisella* Cockerell and Porter, 1899. Ann. and Mag. Nat. Hist. (7) 4: 409. ♂.  
*Entechnia dakotensis* Cockerell and Porter, 1899. Ann. and Mag. Nat. Hist. (7) 4: 409. ♀.
- Biology: Hungerford and Williams, 1912. Ent. News 23: 258. — Cockerell, 1934. Amer. Mus. Novitates 697: 10. — Linsley, 1960. N. Y. Ent. Soc., Jour. 68: 17-18 (floral relationships).
- segmentaria** (Fabricius). Tex. to Argentina. Parasite: *Anthrax cintalapa* Cole, *Monodontomerus mandibularis* Gahan, *Trophocleptia schraderi* Michener?  
*Apis segmentaria* Fabricius, 1804. Systema Piezatorum, p. 371. ♀.  
*Melitoma euglossoides* Lepeletier and Serville, 1828. Encycl. Meth., Hist. Nat. Ins. v. 10, p. 529.  
*Anthophora fulvifrons* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 341.  
*Melissodes?* *marginella* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 282. ♂, ♀.  
*Meliphila ipomoeae* Schrottky, 1902. Mus. Nac. Buenos Aires, An. 7: 311.

Taxonomy: Michener, 1954. Amer. Mus. Nat. Hist., Bul. 104: 131-132, figs. 89-91 (genitalia).  
—Moore, 1960. Studia Ent. 3: 115-116 (synonymy, notes on types).

Biology: Linsley, MacSwain and Smith, 1956. South Calif. Acad. Sci. Bul. 55: 94, figs. 6, 11 (larva). —Michener, 1974. Kans. Ent. Soc., Jour. 47: 19-22 (intermingled nests with *Ancyloscelis* ?*apiformis*, reported as ?*armatus*). —Torchio, 1974: Kans. Ent. Soc., Jour. 47: 54-63, 2 tables (nest association with *Ancyloscelis* ?*armatus*).

*taurea* (Say). N. J. to Fla., west to Ill., Kans. and Mo. Parasite: *Monodontomerus mandibularis* Gahan, *Triepeolus donatus* (Sm.).

*Anthophora taurea* Say, 1837. Boston Jour. Nat. Hist. 1: 410. ♂, ♀.

Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 242-244, figs. 7-8 (redescript.).

Biology: Walsh, 1868. Amer. Ent. 1: 10. —Ashmead, 1894. Psyche 7: 25. —Robertson, 1914. Ent. News 25: 68. —Rau, 1926. Acad. Sci. St. Louis, Trans. 25: 175. —Rau, 1929. Psyche 36: 155. —Rau, 1934. Acad. Sci. St. Louis, Trans. 28: 222. —Michener, 1975. Kans. Ent. Soc., Jour. 48: 194-200, 3 figs. (nesting site, superseded by *Paranthidium jugatorium*).

### TRIBE EUCERINI

This is a very large tribe of pollen-collecting bees which is found on all the continents except Australia. It is especially diverse in the New World, particularly in the Neotropical Region. In America north of Mexico, the Eucerini are represented by 15 of the 18 genera known to occur on the North American continent. Most of the species are solitary, but some live in colonies and all make their nests in the ground.

Taxonomy: Moore and Michener, 1955. Dusenja 6: 239-331, 35 figs. (generic classification of Neotropical genera). —LaBerge, 1957. Amer. Mus. Novitates 1837: 1-44, 42 figs. (generic classification of North and Central American genera). —LaBerge, 1962. Parana Univ., Bol., Zool. 11: 1-12 (types of Eucerine bees in Brit. Mus. Nat. Hist.). —Rozen, 1965. Amer. Mus. Novitates 2233: 3-13, figs. 1-34 (larvae).

### Genus SYNHALONIA Patton

*Synhalonia* Patton, 1879. U. S. Geol. Geog. Survey, Bul. 5: 473.

Type-species: *Melissodes fulvitaris* Cresson. Orig. desig.

*Eusynhalonia* Ashmead, 1899. Amer. Ent. Soc., Trans. 26: 63.

Type-species: *Melissodes edwardsii* Cresson. Monotypic and orig. desig.

*Synalonia* Robertson, 1905. Amer. Ent. Soc., Trans. 31: 365. Emend.

The bees of this North American genus fly primarily during the spring months and are observed only exceptionally during the summer. A second generation may occur in some species since specimens have been collected as late as August. Insofar as known, the females do not collect pollen from the flowers of Compositae, but visit the flowers of a wide range of plant families, including especially the Ranunculaceae, Leguminosae, Hydrophyllaceae, Boraginaceae, and Saxifragaceae. At least some of the species are apparently oligolectic.

Revision: Timberlake, 1969. Calif. Univ. Pubs. Ent. 57: 1-76, 80 figs. (spp. of western U. S.).

Taxonomy: Robertson, 1905. Amer. Ent. Soc., Trans. 31: 366-367 (Illinois species).

—Cockerell, 1906. Amer. Ent. Soc., Trans. 32: 74-97. —Cockerell, 1914. Ann. and Mag. Nat. Hist. (8) 8: 284-286 (partial key). —Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 312-323, figs. 87-89 (eastern U. S. spp.).

Biology: Rust and Clement, 1977. Kans. Ent. Soc., Jour. 50:41-43, table 3 (spp. visiting flowers of *Collinsia sparsiflora*).

*acerba* (Cresson). Calif., Oreg., Nev., Utah, Mont. Pollen: Apparently an oligolectic of *Arctostaphylos*, but also visits flowers of *Ribes aureum*, *Taraxacum vulgare*.

*Melissodes acerba* Cresson, 1879. Amer. Ent. Soc., Trans. 7: 210. ♀.

*Melissodes nevadensis* Cresson, 1879 (not 1874). Amer. Ent. Soc., Trans. 7: 209. ♂. Preocc.

*Melissodes intrudens* Cresson, 1879. Amer. Ent. Soc., Trans. 7: 225. N. name.

Taxonomy: Fowler, 1899. Canad. Ent. 10: 138. ♂.



**actuosa** (Cresson). Wash. and Idaho, south to Calif., Utah, Ariz., and N. Mex. Pollen: Polylege, visits a wide variety of flowers including *Agoseris heterophylla*, *Amsinckia douglasiana*, *A. intermedia*, *Antirrhinum*, *Aplopappus*, *Astragalus*, *Brassica campestris*, *Brodiaea laxa*, *Calochortus*, *Chaenactis*, *Cirsium*, *Collinsia*, *Coreopsis californica*, *Cryptantha intermedia*, *Dodecatheon*, *Eriodictyon californicum*, *Erodium cicutarium*, *Eschscholzia californica*, *Haplopappus linearifolius*, *Helianthus nuttallii*, *Hesperochiron californica*, *Lasthenia chrysostoma*, *L. gracilis*, *Layia glandulosa*, *L. platyglossa*, *Lesquerella gordonii*, *Linanthus*, *Lotus*, *Lupinus bicolor*, *L. densiflorus*, *L. nanus*, *L. succulentus*, *Medicago hispida*, *Melilotus*, *Oenothera pallida*, *Oreocarya*, *Orthocarpus purpurascens*, *Phacelia ciliata*, *P. distans*, *P. humilis*, *Plagiobothrys californicus*, *Prunus*, *Ranunculus californicus*, *Raphanus sativus*, *Rhamnus*, *Rhododendron*, *Salix*, *Salvia columbariae*, *Sambucus*, *Sisyrinchium bellum*, *Tamarix gallica*, *Trifolium repens*, *T. tridentatum*, *Wyethia*. *Diadasia tricineta* Provancher, listed in this catalog as possibly a synonym of *Diadasia enavata* (Cresson), may be a synonym of this species (see Timberlake, 1969. Calif. Univ. Pubs. Ent. 57:13).

*Melissodes actuosa* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 208. ♀.

*Synhalonia californica* Fowler, 1899. Canad. Ent. 31: 137. ♀. Preocc.

*Synhalonia fowleri* Cockerell, 1905. South. Calif. Acad. Sci., Bul. 4: 28. ♀.

*Synhalonia territtella* Cockerell, 1909. Entomologist 38: 146. ♂.

**albescens** Timberlake. Calif., Ariz., Nev. Pollen: Polylege, visits flowers of *Amsinckia*, *Aster abatus*, *Dalea saundersii*, *Delphinium parishii*, *Larrea tridentata*, *Lycium torreyi*, *Oenothera clavaeformis*, *Prosopis*, *Salvia carduacea*, *Sphaeralcea ambigua*, *S. orcuttii*, *Tamarix*.

*Synhalonia albescens* Timberlake, 1969. Calif. Univ. Pubs. Ent. 57: 14, figs. 5, 6. ♀, ♂.

Biology: Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 42 (floral information).

**amsinckiae** Timberlake. Wash. (Pullman and Wawawai), Calif.; Mexico (Baja California).

Pollen: Apparently an oligolege of *Amsinckia* including *A. douglasiana*, *A. intermedia*, *A. eastwoodae*, *A. tessellata*, but also visits flowers of *Arctostaphylos glauca*, *Encelia californica*, *Lantana sellowiana*, *Phacelia*, *Raphanus sativus*, *Salvia columbariae*, *S. mellifera*.

*Synhalonia amsinckiae* Timberlake, 1969. Calif. Univ. Pubs. Ent. 57: 15, figs. 7, 8. ♀, ♂.

**angustifrons** Timberlake. Oreg., Calif., Ariz., Utah; Mexico (Baja California). Pollen: Polylege, visits a wide variety of flowers including *Amsinckia intermedia*, *Arctostaphylos mariposa*, *Astragalus pachypus*, *Brassica incana*, *Cercidium*, *Cryptantha*, *Cynoglossum*, *Dudleya*, *Encelia californica*, *Eriogonum*, *Lantana sellowiana*, *Larrea tridentata*, *Lotus scoparius*, *Lupinus excubitus*, *L. formosus*, *L. paynei*, *Parkinsonia aculeata*, *Penstemon antirrhinoides*, *P. palmeri*, *P. spectabilis*, *Phacelia distans*, *Prunus fasciculata*, *Rhus trilobata*, *Salvia apiana*, *S. columbariae*, *S. dorrii*, *S. mellifera*, *Sambucus*, *Scrophularia californica*.

*Synhalonia angustifrons* Timberlake, 1969. Calif. Univ. Pubs. Ent. 57: 16, figs. 9, 10. ♀, ♂.

**aragalli** Cockerell. Colo., Tex. Pollen: Unknown, but visits flowers of *Astragalus*, *Oxytropis lambertii*.

*Synhalonia frater aragalli* Cockerell, 1904. Ann. and Mag. Nat. Hist. (7) 14: 25. ♀.

**argyrophila** (Cockerell). Tex. Pollen: Unknown, but visits flowers of *Astragalus*, *Dalea formosa*.

*Tetralonia argyrophila* Cockerell, 1909. Entomologist 42: 147. ♂.

**atriventris** (Smith). Minn. to Mass., south to Ga. Pollen: Unknown, but visits flowers of *Aesculus*, *Astragalus*, *Lathyrus*, *Lupinus*, *Mertensia*, *Penstemon hirsutus*, *Robinia*, *Vicia*.

*Melissodes atriventris* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 310. ♂.

*Synhalonia atriventris fuscipes* Robertson, 1900. Acad. Sci. St. Louis, Trans. 10: 54. ♀. Preocc.

*Tetralonia robertsoni* Cockerell, 1914. Ann. and Mag. Nat. Hist. (8) 13: 283. ♀. N. name.

Taxonomy: Robertson, 1897. Acad. Sci. St. Louis, Trans. 7: 353. ♂, ♀.

Biology: Rau, 1934. Acad. Sci. St. Louis, Trans. 28: 211 (nesting habits).

**bakeri** Timberlake. N. Mex. (Aztec).

*Synhalonia bakeri* Timberlake, 1973. Ent. Soc. Wash., Proc. 75: 317. ♂.

**belfragii** (Cresson). Mich., Ill., Ind., Tex. Pollen: Unknown, but visits flowers of *Aesculus*, *Arabis*, *Camassia*, *Cercis canadensis*, *Claytonia*, *Collinsia*, *Dentaria*, *Dicentra*, *Erythronium*, *Geranium*, *Hydrophyllum*, *Isopyrum*, *Lithospermum*, *Mertensia*, *Penstemon ambiguus*, *Phacelia*, *Polemonium*, *Ranunculus*, *Viola*.

*Melissodes belfragii* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 278. ♀.

*Melissodes honesta* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 279. ♂.

**birkmanniella** (Cockerell). Tex.

*Tetralonia birkmanniella* Cockerell, 1906. Amer. Ent. Soc., Trans. 32: 93. ♂.

**californica californica** (Cresson). Calif. Pollen: Unknown, but visits flowers of *Raphanus sativus*.

*Melissodes Californica* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 196. ♂.

**californica deserticola** Timberlake. South Calif., desert. Pollen: Apparently polylectic, visits flowers of *Amsinckia*, *Astragalus*, *Coreopsis californica*, *Gilia davyi*, *G. latifolia*, *Isomeris*, *Oenothera*, *Phacelia*, *Salvia carduacea*, *Sphaeralcea*, *Tamarix gallica*.

*Synhalonia californica deserticola* Timberlake, 1969. Calif. Univ. Pubs. Ent. 57: 24. ♀, ♂.

**carolinensis** (Dalla Torre). N. C.

*Tetralonia atrifrons* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 308. ♀. Preocc.

*Eucera carolinensis* Dalla Torre, 1896. Cat. Hym., v. 10, p. 228. ♀. N. name.

Taxonomy: LaBerge, 1956. Kans. Univ. Sci. Bul. 37: 950.

**cercidis** Timberlake. Okla. (Alabaster Caverns State Park). Pollen: Unknown, but visits flowers of *Cercis canadensis*.

*Synhalonia cercidis* Timberlake, 1969. Calif. Univ. Pubs. Ent. 57: 24, figs. 21, 22. ♂.

**chrysobotryae** (Cockerell). Colo. to Okla., south to Tex. Pollen: Unknown, but visits flowers of *Astragalus* including *A. lindheimeri*, *Cercis canadensis*, *Ribes longifolium*.

*Tetralonia chrysobotryae* Cockerell, 1908. Ann. and Mag. Nat. Hist. (8) 2: 332. ♀, ♂.

**chrysophila** (Cockerell). N. Mex., Colo., Idaho. Pollen: Unknown, but visits flowers of *Ribes aureum*.

*Tetralonia chrysophila* Cockerell, 1914. Ann. and Mag. Nat. Hist. (8) 13: 384. ♀.

**conformis** Timberlake. Okla. (Waurika), Tex. (Midland). Pollen: Unknown, but visits flowers of *Aster tanacetifolius*, *Astragalus lindheimeri*.

*Synhalonia conformis* Timberlake, 1969. Calif. Univ. Pubs. Ent. 57: 27, figs. 25, 26. ♂, ♀.

**cordleyi** Viereck. B. C. to Calif., Idaho, Colo., Utah. Pollen: Apparently polylectic, visits flowers of *Agoseris*, *Amsinckia*, *Asclepias*, *Astragalus*, *Balsamorhiza*, *Brodiaea*, *Camissonia*, *Cirsium*, *Convolvulus*, *Cryptantha*, *Encelia*, *Erigeron*, *Eriogonum*, *Erysimum*, *Lupinus*, *Marrubium*, *Melilotus*, *Mesembryanthemum*, *Mirabilis*, *Oenothera*, *Phacelia*, *Raphanus*, *Salvia*, *Sidalcea*, *Sphaeralcea*, *Statice*, *Taraxacum*, *Thelypodium*, *Trifolium*, *Vicia*.

*Synhalonia Cordleyi* Viereck, 1905. Canad. Ent. 16: 316. ♀, ♂.

*Tetralonia poetica* Cockerell, 1914. Ann. and Mag. Nat. Hist. (8) 13: 424. ♂.

*Tetralonia cordleyi poetica* (?) Cockerell, 1935. Pan-Pacific Ent. 11: 53.

*Tetralonia cordleyi orophila* Cockerell, 1914. Ann. and Mag. Nat. Hist. (8) 13: 284. ♀.

**crenulaticornis** (Cockerell). Colo., N. Mex.

*Melissodes crenulaticornis* Cockerell, 1898. Ann. and Mag. Nat. Hist. (7) 2: 454. ♂.

*Melissodes crenulaticornis* form *maculata* Cockerell, 1898. Ann. and Mag. Nat. Hist. (7) 2: 455. ♂.

Taxonomy: Cockerell, 1899. Entomologist 32: 157. ♀.

**cressoniana** Cockerell. Tex., Kans., Nebr., Ariz., Utah. Pollen: Unknown, but visits flowers of *Larrea tridentata*.

*Synhalonia cressoniana* Cockerell, 1905. Biol. Soc. Wash., Proc. 18: 177. ♀.

Biology: Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 42, tables 14, 15 (floral relationships).

- delphinii** Timberlake. Wash. to Calif., Utah. Pollen: Unknown, but visits flowers of *Bloomeria*, *Brodiaea*, *Delphinium*, *Platystemon*, *Trifolium*.  
*Synhalonia delphinii* Timberlake, 1969. Calif. Univ. Pubs. Ent. 57: 30, figs. 29, 30. ♀, ♂.
- dorsata** Timberlake. Calif. Pollen: Apparently polylectic, visits flowers of *Amsinckia intermedia*, *Brodiaea crocea*, *Collinsia bicolor*, *Convolvulus occidentalis*, *Coreopsis lanceolata*, *Eriodictyon californicum*, *E. crassifolium*, *Eschscholzia californica*, *Grindelia*, *Lathyrus*, *Lotus scoparius*, *Lupinus bicolor*, *L. formosus*, *L. nanus*, *Penstemon antirrhinoides*, *Salvia columbariae*, *S. mellifera*, *Trichostema parishii*.  
*Synhalonia dorsata* Timberlake, 1969. Calif. Univ. Pubs. Ent. 57: 32. ♂, ♀.
- douglasiana** (Cockerell). Wash. (Steamboat Rock).  
*Tetralonia Douglasiana* Cockerell, 1906. Canad. Ent. 38: 278. ♀.
- dubitata** (Cresson). Minn. to Pa., south to S. C. and Tex. Pollen: Unknown, but visits flowers of *Aesculus*, *Astragalus*, *Dicentra*, *Melilotus*, *Mertensia*, *Robinia*, *Salvia*.  
*Melissodes dubitata* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 194. ♀, ♂.
- edwardsii** (Cresson). B. C. to Calif., Idaho, Mont., Utah, Nev., Colo., Wyo., N. Mex.; Mexico (Baja California). Pollen: Polylectic, visits a wide variety of flowers including *Allium*, *Amsinckia*, *Astragalus*, *Abronia*, *Arnica*, *Balsamorhiza*, *Brassica*, *Brodiaea*, *Besseya*, *Cirsium*, *Collinsia sparsiflora*, *Convolvulus*, *Conium*, *Dalea*, *Daucus*, *Erysimum*, *Eschscholzia*, *Encelia*, *Erigeron*, *Helianthus*, *Hydrophyllum*, *Ligustrum*, *Lithospermum*, *Lotus*, *Lupinus*, *Malvastrum*, *Medicago*, *Melilotus*, *Mentha*, *Mesembryanthemum*, *Mirabilis*, *Nemophila*, *Oenothera*, *Penstemon*, *Physocarpus*, *Phacelia*, *Phoradendron*, *Potentilla*, *Raphanus*, *Rhamnus*, *Rubus*, *Sidalcea*, *Sphaeralcea*, *Stachys*, *Taraxacum*, *Trifolium*, *Thelypodium*, *Vicia*, *Viola*, *Zygadenus*.  
*Melissodes edwardsii* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 195. ♂.  
*Synhalonia edwardsii* race *angustior* Cockerell, 1897. Acad. Nat. Sci. Phila., Proc. 49: 347. ♂ (♀ misdet.).  
*Tetralonia edwardsii vagabunda* Cockerell, 1906. Amer. Ent. Soc., Trans. 32: 95. ♂.
- Biology: Rust and Clement, 1977. Kans. Ent. Soc., Jour. 50:42, table 3 (floral visitation).
- frater alboliposa** Fowler. Oreg., Calif. Pollen: Apparently polylectic, visits a wide variety of flowers including *Amsinckia*, *Astragalus*, *Brodiaea*, *Camissonia tanacetifolia*, *Ceanothus*, *Chamaebatia*, *Cirsium*, *Convolvulus*, *Lathyrus*, *Layia*, *Lotus*, *Lupinus*, *Medicago*, *Penstemon*, *Ranunculus*, *Stachys*, *Thermopsis*, *Trifolium*, *Vicia*.  
*Synhalonia alboliposa* Fowler, 1899. Canad. Ent. 10: 138. ♂.
- Taxonomy: Cockerell, 1924. Pan-Pacific Ent. 1: 55.
- frater frater** (Cresson). Colo., Wyo., Utah, Idaho, Oreg., Nev., N. Mex. (Barela Mesa). Pollen: Apparently polylectic, visits flowers of *Astragalus*, *Hedysarum*, *Lithospermum*, *Lupinus*, *Medicago*, *Mertensia*, *Ribes*, *Vicia*. An unnamed variety of this occurs in Utah, Colorado and Washington in which the metasoma of the female is entirely black beyond tergum I.  
*Melissodes frater* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 197. ♂.  
*Tetralonia lata lautipes* Cockerell, 1924. Amer. Mus. Novitates 113: 2. ♀.
- frater lata** (Provancher). B. C., Wash., Oreg. Pollen: Unknown, but visits flowers of *Hydrophyllum*.  
*Melissodes lata* Provancher, 1888. Addit. Corr. Faune Ent. Canada, Hym., p. 302. ♀.  
*Melissodes nigricornis* Provancher, 1888. Addit. Corr. Faune Ent. Canada, Hym., p. 302. ♂.  
*Synhalonia edwardsii* race *latior* Cockerell, 1897. Acad. Nat. Sci. Phila., Proc. 49: 347. ♂.
- fulvitaris annae** (Cockerell). Colo., Wyo., Utah, N. Mex.  
*Tetralonia annae* Cockerell, 1906. Amer. Ent. Soc., Trans. 32: 114. ♀.  
*Tetralonia annae patruelis* Cockerell, 1924. Amer. Mus. Novitates 113: 2. ♀.  
*Tetralonia rotgeri* Cockerell, 1937. Ent. News 48: 256. ♀.
- fulvitaris fulvitaris** (Cresson). Alta. and B. C. to Calif., Nev., Idaho, Colo., Wyo., Kans. (Lawrence). Pollen: Unknown, but visits flowers of *Astragalus*, *Cryptantha*, *Phlox*, *Taraxacum*, *Thelypodium*.  
*Melissodes fulvitaris* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 196. ♂.  
*Tetralonia Yakimensis* Cockerell, 1906. Canad. Ent. 38: 278. ♂.  
*Tetralonia medicata* Cockerell, 1911. Canad. Ent. 43: 34. ♀.

Taxonomy: Patton, 1879. U. S. Geol. and Geog. Survey, Bul. 5: 474. ♀.

**fulvohirta** (Cresson). N. C. to Ga. Pollen: Unknown, but visits flowers of *Elaeagnus*, *Vicia*.  
*Melissodes fulvohirta* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 213. ♂.

**fuscotincta** Cockerell. Ariz., Colo.

*Synhalonia fuscotincta* Cockerell, 1905. Biol. Soc. Wash., Proc. 18: 178. ♂.

**hamata** (Bradley). Eastern U. S., west to S. Dak., Colo., Kans., Nebr. and Mo. Pollen:

Apparently polylectic, visits a wide variety of flowers including *Aesculus*, *Asclepias*, *Astragalus*, *Baptisia*, *Blephilia*, *Brassica*, *Camassia*, *Capsella*, *Cardamine*, *Cercis*, *Claytonia*, *Collinsia*, *Commandra*, *Convolvulus*, *Cornus*, *Crataegus*, *Delphinium*, *Dianthera*, *Dodacatheon*, *Ellisia*, *Erigeron*, *Fragaria*, *Geranium*, *Gleditsia*, *Gymnocladus*, *Heracleum*, *Hydrophyllum*, *Iris*, *Krigia*, *Lithospermum*, *Lythrum*, *Lobelia*, *Medicago*, *Melilotus*, *Mertensia*, *Monarda*, *Nepeta*, *Oenothera*, *Oxalis*, *Penstemon*, *Petalostemon*, *Phlox*, *Podophyllum*, *Polemonium*, *Prunus*, *Ptelea*, *Pyrus*, *Ranunculus*, *Ribes*, *Robinia*, *Rosa*, *Rubus*, *Ruellia*, *Salix*, *Salvia*, *Scutellaria*, *Senecio*, *Stellaria*, *Tradescantia*, *Trifolium*, *Verbena*, *Verbesina*, *Viburnum*, *Vicia*, *Viola*, *Vitis*, *Zizia*.

*Tetralonia hamata* Bradley, 1942. Ent. News 53: 189. ♂, ♀.

**hirsutissima** (Cockerell). B. C.

*Tetralonia hirsutissima* Cockerell, 1916. Ann. and Mag. Nat. Hist. (8) 17: 428. ♀.

**hurdi** Timberlake. B. C. to Calif. Pollen: Apparently polylectic, collects pollen from flowers of *Collinsia sparsiflora*, but also visits flowers of *Allium*, *Brodiaea*, *Cryptantha*, *Lupinus*, *Phacelia*, *Taraxacum*.

*Synhalonia hurdi* Timberlake, 1969. Calif. Univ. Pubs. Ent. 57: 42, figs. 43, 44. ♂, ♀.

Biology: Rust and Clement, 1977. Kans. Ent. Soc., Jour. 50:41, 43, table 3 (nest, cell provisions, floral relationships).

**illinoensis** Robertson. Ill., Mo., Okla. Pollen: Unknown, but visits flowers of *Astragalus lindheimeri*, *Lithospermum canescens*.

*Synhalonia illinoensis* Robertson, 1902. Canad. Ent. 34: 49. ♂.

**lepida** (Cresson). Colo., to Okla. and Tex. Pollen: Unknown, but visits flowers of *Actinia*, *Astragalus*, *Cercis*, *Gaillardia*, *Lesquerella*, *Marrubium*, *Sphaeralcea*.

*Melissodes lepida* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 198. ♂.

**lunata** Timberlake. Oreg., Calif. Utah, Ariz.; Mexico (Baja California). Pollen: Apparently polylectic, visits flowers of *Amsinckia intermedia*, *Arbutus menziesii*, *Arctostaphylos glauca*, *A. mariposa*, *A. pungens*, *Brassica*, *Calendula*, *Collinsia sparsiflora*, *Cryptantha*, *Isomeris arborea*, *Encelia californica*, *Lasthenia chrysostoma*, *Lupinus albifrons*, *L. densiflorus*, *L. latifolius*, *L. micranthus*, *L. nanus*, *L. succulentus*, *Nemophila menziesii*, *Phacelia*, *Phlox*, *Ranunculus occidentalis*, *Ribes indecorum*, *Salix*, *Salvia sonomensis*, *Sidalcea malvaeflora*, *Solanum umbelliferum*, *Trichostema parishii*, *Trifolium tridentatum*, *Wyethia angustifolia*.

*Synhalonia lunata* Timberlake, 1969. Calif. Univ. Pubs. Ent. 57: 46. ♂, ♀.

Biology: Rust and Clement, 1977. Kans. Ent. Soc., Jour. 50:42, table 3 (floral visitation).

**lutiziana** (Cockerell). Colo. Pollen: Unknown, but a male visited flowers of *Sphaeralcea concinna*.

*Tetralonia lutiziana* Cockerell, 1933. Amer. Mus. Novitates 595: 2. ♂.

**lycii** Cockerell. N. Mex. Pollen: Unknown, but visits flowers of *Lycium*, plum, lilac.

*Synhalonia lycii* Cockerell, 1897. Acad. Nat. Sci. Phila., Proc. 49: 348. ♀.

**mohavensis** Timberlake. Calif., Nev., Ariz.; Mexico (Baja California). Pollen: Unknown, but visits flowers of *Sphaeralcea ambigua*, *S. emoryi*, *S. orcuttii*.

*Synhalonia mohavensis* Timberlake, 1969. Calif. Univ. Pubs. Ent. 57: 50, figs. 55, 56. ♂.

**monozona** Timberlake. Oreg. (Klamath Co.), Calif. (Sierra Nevada Mts.).

*Synhalonia monozona* Timberlake, 1969. Calif. Univ. Pubs. Ent. 57: 51. ♀.

**pagosana** (Cockerell). Colo. (Pagosa Springs).

*Tetralonia pagosana* Cockerell, 1925. Ann. and Mag. Nat. Hist. (9) 16: 228. ♀.

**pallidihirta** Timberlake. Tex., Mont. Pollen: Unknown, but visits flowers of *Dalea formosa*.

*Synhalonia pallidihirta* Timberlake, 1969. Calif. Univ. Pubs. Ent. 57: 53. ♀.

- phaceliae** (Cockerell). N. Mex., Utah., Ariz. Pollen: Unknown, but visits flowers of *Descurainia sophia*, *Lesquerella gordonii*, *Phacelia corrugata*, *Sphaeralcea*.  
*Tetralonia phaceliae* Cockerell, 1911. Amer. Ent. Soc., Trans. 37: 238. ♀.
- primaveris** Timberlake. Calif. (Colorado and Mojave Deserts), Nev., Utah, Ariz. (Mohave Co.). Pollen: Apparently polylectic; visits flowers of *Amsinckia*, *Astragalus*, *Aster*, *Brassica*, *Delphinium*, *Encelia*, *Erysimum*, *Gilia*, *Hyptis*, *Isomeris*, *Larrea*, *Lotus*, *Lupinus*, *Oenothera*, *Phacelia*, *Prunus*, *Salvia*, *Sphaeralcea*, *Tamarix*, *Thelypodium*.  
*Synhalonia primaveris* Timberlake, 1969. Calif. Univ. Pubs. Ent. 57: 55, figs. 59, 60. ♂, ♀.
- Biology: Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 43 (floral relationships).
- quadrineta** Timberlake. Calif., Nev., Utah. Pollen: Unknown, but visits flowers of *Astragalus*, *Berberis fremontii*, *Dalea*, *Melilotus officinalis*, *Oenothera clavaeformis* var. *aurantiaca*, *Sphaeralcea ambigua*, *Stanleya*, *Tamarix*, *Thelypodium laciniatum*.  
*Synhalonia quadrineta* Timberlake, 1969. Calif. Univ. Pubs. Ent. 57: 57, figs. 61, 62. ♀, ♂.
- rosae** Robertson. Va. to Ohio, Mo. and Kans., south to Fla. and Tex. Pollen: Apparently polylectic; visits flowers of *Asclepias*, *Batodendron*, *Blephilia*, *Cornus*, *Croton*, *Dianthera*, *Diospyros*, *Elaeagnus*, *Geranium*, *Houstonia*, *Hydrophyllum*, *Iris*, *Linaria*, *Melilotus*, *Monarda*, *Nemophila*, *Oenothera*, *Penstemon*, *Pontederia*, *Rosa*, *Rubus*, *Stachys*, *Trifolium*, *Verbena*, *Xanthisma*.  
*Synhalonia rosae* Robertson, 1900. Acad. Sci. St. Louis, Trans. 10: 54. ♀.  
*Tetralonia fedoris* Cockerell, 1906. Amer. Ent. Soc., Trans. 32: 93. ♂.
- speciosa** (Cresson). S. Dak. to Texas, west to Utah and Idaho. Pollen: Collects pollen from flowers of *Oenothera pallida*, but also visits flowers of *Balsamorhiza*, *Brazoria*, *Caragana*, *Gaillardia*, *Monarda*, *Penstemon*.  
*Melissodes speciosa* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 198. ♀.  
*Melissodes dilecta* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 199. ♂.  
*Synhalonia gillettei* Cockerell, 1905. Ann. and Mag. Nat. Hist. (7) 15: 203. ♂.  
*Synhalonia gillettei snoviana* Cockerell, 1905. Biol. Soc. Wash., Proc. 18: 179. ♂.  
*Synhalonia astragalina* Cockerell, 1905. Ent. News 16: 271. ♂.  
*Tetralonia astragalina clarissima* Cockerell, 1933. Ann. and Mag. Nat. Hist. (10) 11: 372. ♂.
- Taxonomy: Cockerell, 1905. Entomologist 38: 148. ♂. — Bradley, 1942. Ent. News 53: 190.
- Biology: Folsom, 1922. Ent. Soc. Amer., Ann. 15: 182 (nesting habits). — Linsley, MacSwain and Raven, 1963. Calif. Univ. Pubs. Ent. 33: 45-46 (floral relationships).
- stretchii** (Cresson). Oreg., Calif. Pollen: Unknown, but visits flowers of *Cirsium*, *Coreopsis*, *Eriodictyon*, *Fremontodendron*, *Lupinus*, *Vicia*.  
*Melissodes stretchii* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 207. ♀.  
*Synhalonia idiotas* Cockerell, 1905. South. Calif. Acad. Sci., Bul. 4: 105. ♀.
- suavis** (Cresson). Colo.  
*Melissodes suavis* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 210. ♀.
- texana** Timberlake. Tex. (Dallas). Pollen: Unknown, but visits flowers of *Cercis canadensis*.  
*Synhalonia texana* Timberlake, 1969. Calif. Univ. Pubs. Ent. 57: 62, figs. 69, 70. ♂.
- tricinctella** Timberlake. Calif., Utah. Pollen: Apparently polylectic; visits flowers of *Amsinckia intermedia*, *Aster abatus*, *Astragalus tener*, *Chaenactis fremontii*, *Coreopsis californica*, *Cryptantha intermedia*, *Dalea saundersii*, *Encelia farinosa*, *Erysimum*, *Gilia multicaulis*, *Haplopappus cooperi*, *H. linearifolius*, *Lotus scoparius*, *L. strigosus*, *Malacothrix glabrata*, *Plagiobothrys californicus*, *Rhus trilobata*, *Ribes indecorum*, *Salvia columbariae*, *Sambucus*, *Sphaeralcea*, *Tamarix gallica*.  
*Synhalonia tricinctella* Timberlake, 1969. Calif. Univ. Pubs. Ent. 57: 63, figs. 71, 72. ♂, ♀.
- truttiae** Cockerell. N. Mex., Ariz. Pollen: Unknown, but visits flowers of *Iris missouriensis*.  
*Synhalonia truttiae* Cockerell, 1905. Entomologist 38: 147. ♂, ♀.
- venusta carinata** (Timberlake). Calif.; Mexico (Baja California). Pollen: Apparently strictly oligolectic on *Clarkia unguiculata*.  
*Tetralonia venusta carinata* Timberlake, 1961. Pan-Pacific Ent. 37: 212. ♂.

- Biology: MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 70: 31-34, 45, fig. 8 (floral relationships).
- venusta* (Timberlake). Calif., Ariz., Nev.; Mexico (Baja California). Pollen: Apparently oligolectic on *Camissonia clavaeformis*, but visits other flowers evidently for nectar including *Larrea tridentata*, *Sphaeralcea orcuttii*.
- Tetralonia venusta* Timberlake, 1961. Pan-Pacific Ent. 37: 209. ♀, ♂.
- Biology: Linsley, MacSwain and Raven, 1963. Calif. Univ. Pubs. Ent. 33: 20, 46 (behavior, floral relationships). — Linsley, MacSwain and Raven, 1964. Calif. Univ. Pubs. Ent. 33: 77 (behavior, floral relationships). — MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 70: 30, fig. 8 (floral relationships). — Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 43 (floral relationships).
- virgata* Cockerell. Oreg., Calif. Pollen: Unknown, but visits flowers of *Astragalus pomonensis*, *Brodiaea capitata*, *Cirsium*, *Phacelia*, *Pogogyne parviflora*, *Rhododendron*, *Trichostema lanata*.
- Synhalonia belfragei virgata* Cockerell, 1905. South. Calif. Acad. Sci., Bul. 4: 100. ♀.
- zonata* Timberlake. Oreg., Calif. Pollen: Unknown, but visits flowers of *Amsinckia intermedia*, *Cryptantha*, *Lupinus nanus*, *Nemophila menziesii*, *Plagiobothrys*.
- Synhalonia zonata* Timberlake, 1969. Calif. Univ. Pubs. Ent. 57: 68, figs. 79, 80. ♀, ♂.

### Genus SYNTRICHALONIA LaBerge

- Syntrichalonia* LaBerge, 1957. Amer. Mus. Novitates 1837: 10.
- Type-species: *Melissodes exquisita* Cresson. Monotypic and orig. desig.
- exquisita* (Cresson). Tex., N. Mex., Ariz.; Mexico (D. F., Durango, Jalisco and Zacatecas). Pollen: Oligolectic, principally composite tribes Helenieae and Heliantheae including *Encelia*, *Helenium hoopesii*, *Helianthus annuus*, *Heliopsis parviflora*, *Verbesina encelioides*, *V. oreophila*, *Viguiera dentata*, but visits other flowers for nectar.
- Melissodes exquisita* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 213. ♀.
- Melissodes herricki* Cockerell, 1905. Psyche 12: 98. ♂, ♀.
- Biology: Zavortink, 1975. Pan-Pacific Ent. 51: 240-242, table 3 (host plants, behavior, distribution).

### Genus EUCERA Scopoli

- Eucera* Scopoli, 1770. Annus Hist. Nat., v. 4, p. 8.
- Type-species: *Apis longicornis* Linnaeus. Desig. by Latreille, 1810.
- maculata* Lepeletier. America. No doubt exotic or incorrectly assigned to *Eucera*.
- Eucera maculata* Lepeletier, 1841. Hist. Nat. Ins., Hym., v. 2, p. 129. ♀.

### Genus XENOGLOSSA Smith

The bees of this North and Central American genus are dependent solely upon the pollen and to a large extent upon the nectar of both cultivated and uncultivated *Cucurbita* (squashes, gourds and pumpkins). Like the species of the genus *Peponapis*, the males commonly spend most of the day and a good part of the night in the wilted and closed flowers of these plants. At the beginning of the season and before nesting activities are commenced it is also not unusual to encounter females in the wilted and closed flowers. The pollen collecting devices of the species are species-specific and apparently this has influenced the ability of the different species to collect and utilize pollens of various *Cucurbita*, both wild and domestic. These bees are exceptionally valuable pollinators of the squashes, gourds and pumpkins.

Revision: Hurd and Linsley, 1964. Hilgardia 35: 384-425, figs. 1-11 (U. S. spp.). — Hurd and Linsley, 1967. Ent. Soc. Amer., Ann. 60: 988-1007, 19 figs., 2 tables, 5 maps (North and Centr. Amer. spp.). — Hurd and Linsley, 1970. Calif. Univ. Pubs. Ent. 62: 1-39, 11 figs. 4 tables, 3 maps (classification).

Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 246-249, figs. 73-74 (eastern U. S. spp.). — Rozen, 1965. Amer. Mus. Novitates 2233: 6-11, figs. 1-19 (larva).

Biology: Michelbacher, Smith and Hurd, 1964. Calif. Agr. 18: 2-4, figs. (pollination of squashes, gourds and pumpkins). — Hurd and Linsley, 1964. Hilgardia 35: 376-382, 2 tables (biol. summary). — Michelbacher, Hurd and Linsley, 1968. Bee World 49: 159-167, 6 figs. (feasibility of introducing squash bees into the Old World). — Hurd, Linsley and Whitaker, 1971. Evolution 25: 218-234, 4 figs., 3 tables (squash bees and origin of cultivated *Cucurbita*).

### Genus XENOGLOSSA Subgenus EOXENOGLOSSA Hurd and Linsley

*Xenoglossa* subg. *Eoxenoglossa* Hurd and Linsley, 1970. Calif. Univ. Pubs. Ent. 62: 34.

Type-species: *Melissodes strenua* Cresson. Orig. desig.

**kansensis** Cockerell. N. C. and Ga., west to Colo., N. Mex. and Tex. Pollen: Oligolectic on *Cucurbita foetidissima* and domestic species of *Cucurbita*.

*Xenoglossa strenua* var. *Kansensis* Cockerell, 1905. Psyche 12: 104. ♂.

**strenua** (Cresson). Transcont., Md. to Fla., west to south. Calif., south to San Luis Potosi, Durango, Baja California and Sinaloa, Mexico. Parasite: *Triepeolus remigatus* (Fabr.). Pollen: Oligolectic on *Cucurbita foetidissima* and domestic species of *Cucurbita*. Pollen collecting females have been found occasionally at the flowers of *Cucurbita digitata* and *C. palmata*, but these plants do not appear to be preferred pollen sources.

*Melissodes strenua* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 213. ♀, ♂.

*Xenoglossa cucurbitarum* Cockerell, 1896. Canad. Ent. 28: 192. ♂, ♀.

Taxonomy: Bohart, 1964. Pan-Pacific Ent. 40: 174-182, 17 figs. (larva). — Rozen, 1965. Amer. Mus. Novitates 2233: 10-11, figs. 15-19 (larva).

Biology: Bohart, 1964. Pan-Pacific Ent. 40: 174-182, 17 figs. (nesting habits, nest architecture, parasite). — Bohart, 1966. Pan-Pacific Ent. 42: 255-262, 20 figs. (parasite).

### Genus XENOGLOSSA Subgenus XENOGLOSSA Smith

*Xenoglossa* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 315.

Type-species: *Xenoglossa fulva* Smith. Monotypic.

#### SPECIES GROUP PATRICIA

**angustior** Cockerell. Calif., Ariz., N. Mex.; Mexico (Baja California and Sonora). Pollen: Oligolectic on *Cucurbita digitata*, *C. foetidissima*, *C. palmata* and most, if not all, domestic *Cucurbita* grown within its geographic range.

*Xenoglossa patricia angustior* Cockerell, 1899. Entomologist 33: 64. ♂.

Taxonomy: Rozen, 1965. Amer. Mus. Novitates 2233: 8-10, figs. 3-10 (larva).

**patricia** Cockerell. N. Mex., Tex.; Mexico (Chihuahua, Coahuila, and Durango). Pollen: Oligolectic on *Cucurbita foetidissima* and most, if not all, domestic *Cucurbita* grown within its geographic range.

*Xenoglossa patricia* Cockerell, 1896. Canad. Ent. 28: 191. ♂, ♀.

#### SPECIES GROUP FULVA

**gabbii crawfordi** Cockerell. South. Ariz.; Mexico (south to Michoacan and Morelos). Pollen: Oligolectic on *Cucurbita martinuzzi*, *C. sororia* and most, if not all, domestic *Cucurbita* grown within its geographic range. The typical subspecies occurs in southern Mexico (Oaxaca and Chiapas) and Central America (Costa Rica, El Salvador, Guatemala, Nicaragua, and possibly Panama).

*Xenoglossa crawfordi* Cockerell, 1910. Ann. and Mag. Nat. Hist. (8) 5: 367. ♂.

*Xenoglossa dugesi* Cockerell, 1919. U. S. Natl. Mus., Proc. 55: 194. ♀.

Biology: Michelbacher and Hurd, 1968. Pan-Pacific Ent. 44: 58-68, 1 fig., 3 tables (nest site, late season foraging behavior). — Michelbacher and Hurd, 1968. Folia Ent. Mexicana 18-19: 110-111 (ecology and distribution).

### Genus CEMOLOBUS Robertson

*Cemolobus* Robertson, 1902. Canad. Ent. 34: 324.

Type-species: *Xenoglossa ipomoeae* Robertson. Monotypic and orig. desig.

**ipomoeae** (Robertson). Ill., Pa., N. C., Ga. Pollen: Oligolectic on species of *Ipomoea*.  
*Xenoglossa ipomoeae* Robertson, 1891. Amer. Ent. Soc., Trans. 18: 65. ♀, ♂.

Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 250-251, figs. 75, 76 (redescription).

### Genus **ANTHEDONIA** Michener

*Anthedon* Robertson, 1900. Acad. Sci. St. Louis, Trans. 10: 53. Preocc.

Type-species: *Melissodes compta* Cresson. Monotypic.

*Anthedonia* Michener, 1942. N. Y. Ent. Soc., Jour. 50: 282. N. name.

*Abda* Sandhouse, 1943. U. S. Natl. Mus., Proc. 92: 521. N. name.

Taxonomy: LaBerge, 1955. Kans. Ent. Soc., Jour. 28: 132-135, 2 figs. (synopsis). — LaBerge, 1957. Amer. Mus. Novitates 1837: 19-22, figs. 19-21 (generic diagnosis).

**compta** (Cresson). N. J. and Ga. west to Utah and N. Mex.; Mexico (Durango). Pollen:

Oligolectic on *Oenothera biennis*, but visits other flowers for nectar.

*Melissodes compta* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 199. ♀, ♂.

Taxonomy: LaBerge, 1955. Kans. Ent. Soc. Jour. 28: 132, fig. 1. ♂, ♀. — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 252-253, fig. 77 (redescription).

Biology: Robertson, 1914. Ent. News 25: 72.

**nevadensis** (Cresson). Tex. west to Calif.; Mexico (Durango). Pollen: Oligolectic on *Oenothera*, but visits other flowers for nectar.

*Melissodes nevadensis* Cresson, 1874. Amer. Ent. Soc., Trans. 5: 102. ♂.

*Melissodes californica* Smith, 1879. Descr. New Species Hym. Brit. Mus., p. 114. ♀, ♂ Preocc.

*Eucera smithii* Dalla Torre, 1896. Cat. Hym., v. 10, p. 247. ♂, ♀. N. name.

Taxonomy: Cockerell, 1905. Amer. Ent. Soc., Trans. 31: 328. — LaBerge, 1955. Kans. Ent. Soc., Jour. 28: 134, fig. 2. ♂, ♀.

### Genus **SVASTRA** Holmberg

Revision: LaBerge, 1956. Kans. Univ. Sci. Bul. 37: 926-1027 (as subg. *Brachymelissodes* and *Epimelissodes* of the genus *Melissodes*).

Taxonomy: Michener, LaBerge and Moure, 1955. Dusenja 6: 219-220. — Moure and Michener, 1955. Dusenja 6: 294-298. — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 255-263, figs. 79-80 (spp. of eastern U. S.).

### Genus **SVASTRA** Subgenus **SVASTRA** Holmberg

*Svastra* Holmberg, 1884. Acad. Nac. Cienc. Cordoba, Actas 5: 127.

Type-species: *Svastra bombilans* Holmberg. Orig. desig.

The typical subgenus does not occur in North America.

### Genus **SVASTRA** Subgenus **BRACHYMELISSODES** LaBerge

*Melissodes* subg. *Brachymelissodes* LaBerge, 1956. Kans. Univ. Sci. Bul. 37: 926.

Type-species: *Eucera cressonii* Dalla Torre. Orig. desig.

**cressonii** (Dalla Torre). Iowa, Nebr. and east. Colo. south to Tex.; Mexico (Durango). Pollen: Collects pollen from flowers of *Euphorbia marginata* and possibly *Vernonia*, but also visits other flowers including *Cardia*, *Helianthus*, *Polygonum*.

*Melissodes brevicornis* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 281. ♂. Preocc.

*Eucera cressonii* Dalla Torre, 1896. Cat. Hym., v. 10, p. 229. N. name.

*Melissodes petuliciformis* Cockerell, 1906. Ann. and Mag. Nat. Hist. (7) 17: 364. ♀.

Taxonomy: Crawford, 1903. Canad. Ent. 35: 334. ♀. — Cockerell, 1906. Ann. and Mag. Nat. Hist. (7) 17: 367.

Biology: Cockerell, 1915. Ent. News 26: 364 (resting cluster).



Genus *SVASTRA* Subgenus *EPIMELISSODES* Ashmead

*Epimelissodes* Ashmead, 1899. Amer. Ent. Soc., Trans. 26: 63.

Type-species: *Melissodes atripes* Cresson. Monotypic and orig. desig.

## SPECIES GROUP ATRIPES

- atripes atrimitra** (LaBerge). N. J. south to Fla., Ala., Miss. Pollen: Unknown, but visits flowers of *Azelia*, *Bradburya virginiana*, *Buddleia*, *Chamaecrista*, *Gerardia*, *Gossypium herbaceum*, *Hibiscus*, *Koellia hysopifolia*, *Kuhnistera*, *Monarda punctata*, *Passiflora incarnata*, *Primula vulgaris*, *Rhus*.  
*Melissodes (Epimelissodes) atripes atrimitra* LaBerge, 1956. Kans. Univ. Sci. Bul. 37: 949. ♂, ♀.

Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 259 (floral records).

- atripes atripes** (Cresson). Ill., Mo., and La., west to N. Mex. and Colo. Pollen: Unknown, but visits flowers of *Asclepias incarnata*, *Aster*, *Bidens aristosa*, *Cassia fasciculata*, *Chrysopsis*, *Cleome serrulata*, *Dalea lanata*, *Gaillardia*, *Gonolobus laevis*, *Gossypium herbaceum*, *Helenium*, *Helianthus annuus*, *Ipomoea pandurata*, *Kuhnistera*, *Lythrum alatum*, *Melilotus alba*, *Pycnanthemum virginianum*, *Thelesperma megapotamicum*, *Verbena hastata*, *V. stricta*, *Vernonia fasciculata*.  
*Melissodes atripes* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 275. ♀.

Taxonomy: Robertson, 1898. Acad. Sci. St. Louis, Trans. 8: 54. ♀, ♂. — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 257, fig. 80 (redescription, floral records).

- atripes georgica** (Cresson). East coast of Ga. and Fla. Pollen: Unknown, but visits flowers of *Bidens*, *Rhus*.

*Melissodes georgica* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 200. ♂.

Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 259 (tax. characters, floral records).

## SPECIES GROUP OBLIQUA

- aegis** (LaBerge). Tex. to Fla., north to N. C. Pollen: Unknown, but visits flowers of *Aster pruinosa*, *Chrysopsis*, *Helenium tenuifolium*, *Helianthus annuus*, *H. radula*, *Kuhnistera*, *Vernonia glauca*.

*Melissodes (Epimelissodes) aegis* LaBerge, 1956. Kans. Univ. Sci. Bul. 37: 959. ♂, ♀.

Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 256-257, fig. 79 (redescription, floral records).

- comanche** (Cresson). Colo., N. Mex., Tex. Pollen: Unknown, but males visit flowers of *Ximenesia californica*.

*Melissodes comanche* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 276. ♀, ♂.

- grandissima** (Cockerell). Southeast. Tex. Pollen: Unknown, but the sexes have been collected at flowers of *Ximenesia encelioides*.

*Melissodes grandissima* Cockerell, 1905. Canad. Ent. 37: 334. ♀.

*Melissodes atripes* var. *acomanche* Cockerell, 1906. Amer. Ent. Soc., Trans. 32: 109. ♂.

Taxonomy: Cockerell, 1906. Ann. and Mag. Nat. Hist. (7) 17: 361. ♂. — LaBerge, 1963. Kans. Ent. Soc., Jour. 36: 56 (geogr. records).

- helianthelli** (Cockerell). Tex., and Kans. west to South. Calif.; Mexico (Baja California). Pollen: Unknown, but has been collected at flowers of *Gossypium herbaceum*, *Helianthus annuus*, *Verbesina encelioides*.

*Melissodes helianthelli* Cockerell, 1905. Ann. and Mag. Nat. Hist. (7) 15: 525. ♀.

- machaerantherae** (Cockerell). Tex. (El Paso) to South. Calif.; Mexico (Chihuahua, Coahuila, Sonora). Pollen: Unknown, but visits flowers of *Asclepias subverticillata*, *Aster*, *Baccharis*, *Cryptantha oblata*, *Cucurbita palmata*, *Haplopappus*, *Helenium hoopesii*, *Helianthus*, *Kallstroemia*, *Machaeranthera*, *Melilotus alba*, *Verbesina oreophila*, *Wislizenia refracta*.

*Melissodes machaerantherae* Cockerell, 1904. Ann. and Mag. Nat. Hist. (7) 14: 21. ♂, ♀.

Taxonomy: LaBerge, 1963. Kans. Ent. Soc., Jour. 36: 55 (geogr. and floral records).

**obliqua caliginosa** (Cresson). N. J. to Ga. Pollen: Unknown, but visits flowers of *Borrchia frutescens*, *Cirsium*, *Cucurbita*, *Helenium tenuifolium*, *Helianthus atrorubens*, *H. microcephalum*, *H. zonatus*, *Vernonia glauca*, *V. noveboracensis*.  
*Melissodes caliginosa* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 192. ♀, ♂.

Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 261 (redescript.).

**obliqua expurgata** (Cockerell). Wash. and Idaho south to Calif., Colo. and Ariz.; Mexico (Baja California). Pollen: Unknown, but visits flowers of *Achillea*, *Artemisia*, *Asclepias*, *Brassica adpressa*, *Centaurea*, *Centromadia pungens*, *Chrysopsis grandiflora*, *C. lanceolata*, *Coreopsis lanceolata*, *Engelmannia pinnatifida*, *Gaillardia*, *Geranium atropurpureum*, *Gilia capitata*, *Grindelia camporum*, *G. nana*, *Haplopappus vernonioides*, *Helianthus annuus*, *H. bolanderi*, *H. ciliaris*, *H. gracilentus*, *H. petiolaris*, *Heliotropium curassavicum*, *Hemizonia pungens*, *Lepidospartum squamatum*, *Medicago sativa*, *Melilotus alba*, *Petalostemon flavescens*, *Pluchea sericea*, *Ratibida columnaris*, *Scabiosa*, *Senecio douglasii*, *Solidago*, *Verbesina encelioides*, *Wislizenia refracta*.

*Melissodes obliqua* var. *expurgata* Cockerell, 1925. Ann. and Mag. Nat. Hist. (9) 16: 230. ♂.

**obliqua obliqua** (Say). Southern Ont. and eastern Mont., south to N. Mex. and N. J.; west of the Appalachians to Fla.; Mexico (Tamaulipas, Coahuila). Parasite: *Tripeolus concavus* (Cress.), *T. rufithorax* Graenicher, *Timulla vagans rufinota* Mickel? Pollen: Presumably oligolectic on the Compositae, but visits a wide variety of flowers including *Abutilon theophrasti*, *Ambrosia*, *Asclepias incarnatus*, *A. syriaca*, *Aster ericoides*, *Bidens involucreta*, *B. aristosa*, *Blephilia hirsuta*, *Boltonia asteroides*, *Carduus crispus*, *Cassia*, *Cephalanthus occidentalis*, *Chrysopsis*, *Cirsium discolor*, *C. lanceolatum*, *C. undulatus*, *Cleome serrulata*, *Coreopsis tinctoria*, *C. tripteris*, *Echinacea pallida*, *Erigeron philadelphicus*, *Euphorbia*, *Gaillardia*, *Gossypium herbaceum*, *Grindelia squarrosa*, *Helenium altissimum*, *H. autumnale*, *Helianthus annuus*, *H. divaricatus*, *H. grosse-serratus*, *H. laetiflorus*, *H. maximilianus*, *H. mollis*, *H. petiolaris*, *H. scaberimus*, *H. strumosus*, *H. tuberosus*, *Heliosis helianthioides*, *H. laevis*, *Ipomoea pandurata*, *Kuhnistera purpurea*, *Lacinaria pycnostachys*, *Lactuca floridana*, *Lobelia leptostachys*, *L. siphilitica*, *Lythrum alatum*, *L. salicaria*, *Medicago sativa*, *Melilotus alba*, *Monarda fistulosa*, *Nepeta cataria*, *Oenothera biennis*, *Petalostemon candidens*, *P. oligophyllum*, *Prionopsis ciliata*, *Psoralea tenuiflora*, *Pycnanthemum flexuosum*, *P. pilosum*, *Ratibida columnaris*, *R. pinnata*, *Rudbeckia hirta*, *R. laciniata*, *R. subtomentosa*, *R. triloba*, *Schrankia uncinata*, *Silphium integrifolium*, *S. laciniatum*, *S. perfoliatum*, *S. speciosum*, *S. terebinthinaceum*, *Solidago missouriensis*, *S. rigida*, *S. serotina*, *Teucrium canadense*, *Trifolium pratense*, *Verbena stricta*, *Vernonia baldwinia*, *V. baldwinia interior*, *V. fasciculata*, *Verbesina helianthoides*, *Zinnia*.

*Macrocera obliqua* Say, 1837. Boston Jour. Nat. Hist. 1: 403. ♂.

Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 259-261, fig. 80

(redescription). — Rozen, 1964. Amer. Mus. Novitates 2170: 9-12, figs. 6, 7, 9-13 (larva).

Biology: Rau, 1922. Acad. Sci. St. Louis, Trans. 24: 35. — Custer, 1928. Canad. Ent. 60: 28.

— Custer, 1929. Psyche 36: 293 (nesting habits, cocoon construction). — Rozen, 1964. Amer.

Mus. Novitates 2170: 1-13, 15 figs. (nesting habits, parasites, ecology).

**texana eluta** (LaBerge). Deserts of south. Calif., Ariz.; Mexico (Chihuahua, Coahuila). Pollen: Unknown, but visits flowers of *Asparagus*, *Asteraginus*, *Helianthus annuus*, *Heterotheca subaxillaris*.

*Melissodes (Epimelissodes) texana eluta* LaBerge, 1956. Kans. Univ. Sci. Bul. 37: 1000. ♂, ♀.

**texana texana** (Cresson). Kans. and Okla., south to Tex., west to N. Mex. and Colo. Pollen: Unknown, but visits flowers of *Chrysothamnus*, *Flaveria angustifolia*, *Helianthus*, *Prionopsis ciliatus*.

*Melissodes texana* Cresson, 1878. Amer. Ent. Soc., Trans. 4: 276. ♀, ♂.

*Melissodes texana flaveriae* Cockerell, 1906. Amer. Ent. Soc., Trans. 32: 108. ♀.

## SPECIES GROUP SILA

**pallidior** LaBerge. Calif. (Riverside Co.). Pollen: Unknown, but visits flowers of *Hoffmanseggia*.

*Svastra* (*Epimelissodes*) *pallidior* LaBerge, 1963. Kans. Ent. Soc., Jour. 36: 52. ♀, ♂.

**sila** (LaBerge). Ariz., Tex.; Mexico (Baja California and Chihuahua). Pollen: Oligolege of Compositae especially *Baileya pleniradiata* and *Heterotheca psammophila*, but also visits flowers of *Heterotheca subarillaris*, *Kallstroemia grandiflora*, *Psilostrophe cooperi*.

*Melissodes* (*Epimelissodes*) *sila* LaBerge, 1956. Kans. Univ. Sci. Bul. 37: 1002. ♂, ♀.

Taxonomy: LaBerge, 1963. Kans. Ent. Soc., Jour. 36: 54 (geogr. and floral records).

Biology: Cazier and Linsley, 1974. Amer. Mus. Novitates 2546: 14-15 (floral relationships).

## SPECIES GROUP PETULCA

**petulca** *petulca* (Cresson). Eastern Tex. north through Kans. to Ill., east to Fla., and north along coast to N. J. Pollen: Unknown, but visits flowers of *Borrichia frutescens*, *Coreopsis cardaminefolia*, *Gaillardia pulchella*, *Gossypium herbaceum*, *Helenium tenuifolium*, *Helianthus*, *Lepachys pinnata*, *Lithospermum canescens*, *Monarda citriodora*, *M. punctata*, *Pycnanthemum flexuosum*, *Pyrrhappus geiseri*, *Ratibida columnaris*, *R. columnifera pulcherrima*, *Rudbeckia amplexicaulis*, *R. bicolor*, *R. submentosa*, *Verbesina helianthoides*.

*Melissodes petulca* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 201. ♀.

*Melissodes illinoensis* Robertson, 1895. Amer. Ent. Soc., Trans 22: 126. ♀, ♂.

Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 261-262, fig. 80 (redescription).

**petulca** *suffusa* (Cresson). Tex. and Kans. west to Colo. and Ariz.; Mexico (Chihuahua, Nuevo Leon, Tamaulipas). Pollen: Unknown, but visits flowers of *Baccharis*, *Borrichia frutescens*, *Chrysopsis hispida*, *Coreopsis*, *Gaillardia pulchella*, *G. suavis*, *Helenium autumnale*, *H. microcephalum*, *Helianthus annuus*, *Medicago sativa*, *Monarda citriodora*, *M. punctata*, *Nepeeta cataria*, *Opuntia*, *Phacelia*, *Ratibida columnaris*, *R. tagetes*, *Rudbeckia hirta*, *Sphaeralcea*, *Tetragonothera ludoviciana*, *Thelesperma megapotamicum*.

*Melissodes suffusa* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 203. ♀, ♂.

*Melissodes townsendi* Cockerell, 1896. Entomologist 29: 304. ♂.

**sabinensis** *laterufa* (Cockerell). Tex., N. Mex., ?Ariz. (Baboquivari Mts.); Mexico (Coahuila, Durango).

*Melissodes suffusa* var. *laterufa* Cockerell, 1934. Amer. Mus. Novitates 697: 10. ♀.

**sabinensis** *nubila* (LaBerge). South. Calif.; Mexico (Baja California). Pollen: Unknown, but visits flowers of *Bebbia juncea*, *Chrysanthemum segetum*, *Chrysothamnus*, *Coreopsis lanceolata*, *Corethrogyne filaginifolia*, *Encelia farinosa*, *Gutierrezia californica*, *G. sarothrae*, *Haplopappus vernonioides*, *Helianthus annuus*, *Hemizonia paniculata*, *Heterotheca grandiflora*, *Senecio douglasii*, *Stephanomeria exigua*.

*Melissodes* (*Epimelissodes*) *sabinensis nubila* LaBerge, 1956. Kans. Univ. Sci. Bul. 37: 1024. ♂, ♀.

**sabinensis** *sabinensis* (Cockerell). South Calif., Ariz., N. Mex. Pollen: Unknown, but visits flowers of *Acacia*, *Dalea albiflora*, *Haplopappus*, *Heterotheca*, *Kallstroemia grandiflora*, *Petalostemon*, *Psilostrophe cooperi*, *Sida diffusa*, *Sphaeralcea*, *Verbesina*, *Viguiera*.

*Melissodes sabinensis* Cockerell, 1924. Amer. Mus. Novitates 113: 1. ♂.

## Genus SVASTRA Subgenus IDIOMELISSODES LaBerge

*Melissodes* subg. *Idiomelissodes* LaBerge, 1956. Kans. Univ. Sci. Bul. 37: 1027.

Type-species: *Melissodes duplocincta* Cockerell. Monotypic and orig. desig.

Taxonomy: LaBerge, 1957. Amer. Mus. Novitates 1837: 5, 7, 23-25 (generic status).

—LaBerge, 1961. Kans. Univ. Sci. Bul. 42: 284 (as subgenus of *Svastra*).

**duplocincta** (Cockerell). N. Mex. to Calif. (Colorado Desert); Mexico (Baja California, Chihuahua and Coahuila). Pollen: Collects pollen from flowers of *Ferrocactus wislizeni* and is probably an oligolege of *Ferrocactus* and possibly other cacti, but visits other flowers for nectar including *Asclepias*, *Cevallia sinuata*, *Eriogonum*, *Gossypium herbaceum*, *Hoffmanseggia densiflora*, *Lippia wrightii*, *Melochia tomentosa*, *Sphaeralcea*, *Wislizenia refracta* var. *mamillata*.  
*Melissodes duplocincta* Cockerell, 1905. Psyche 12: 103. ♂, ♀.

Biology: Zavortink, 1975. Pan-Pacific Ent. 51: 236-240, tables 1, 2 (host plants, behavior, distribution).

### Genus XENOGLOSSODES Ashmead

?*Tetraloniella* Ashmead, 1899. Amer. Ent. Soc., Trans. 26: 61.

Type-species: *Macrocera graia* Eversmann. Monotypic and orig. desig.

*Xenoglossodes* Ashmead, 1899. Amer. Ent. Soc., Trans. 26: 63.

Type-species: *Melissodes albata* Cresson. Monotypic and orig. desig.

Revision: Cockerell, 1906. Amer. Ent. Soc., Trans. 32: 74-92.

**albata** (Cresson). Ill., S. Dak., Kans., Colo., Okla., Tex. Pollen: Unknown, but visits flowers of *Petalostemon purpureum*.

*Melissodes albata* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 281. ♀, ♂.

Taxonomy: Patton, 1879. U. S. Geol. and Geog. Survey, Bul. 5: 474. ♂, ♀.

**arizonica** Cockerell. Ariz., Calif. (Imperial Co.).

*Xenoglossodes arizonica* Cockerell, 1937. Amer. Mus. Novitates 948: 7. ♂.

**bishoppi** (Cockerell). Tex.

*Melissodes bishoppi* Cockerell, 1914. Canad. Ent. 46: 414. ♂.

**davidsoni** (Cockerell). Calif.; Mexico (Baja California). Pollen: Unknown, but visits flowers of *Convolvulus occidentalis*, *Coreopsis maritima*, *Encelia californica*.

*Xenoglossa davidsoni* Cockerell, 1905. South. Calif. Acad. Sci., Bul. 4: 28. ♀.

*Synhalonia hirsutior* Cockerell, 1905. South. Calif. Acad. Sci., Bul. 4: 29. ♂.

Taxonomy: Cockerell, 1935. Pan-Pacific Ent. 11: 53. ♂.

**eriocarpi** (Cockerell). Tex., N. Mex., Ariz., south. Calif. Pollen: Unknown, but visits flowers of *Larrea tridentata*, *Sideranthus gracilis*.

*Eromalopsis eriocarpi* Cockerell, 1898. Ann. and Mag. Nat. Hist. (7) 2: 453. ♀.

Biology: Hurd and Linsley, 1975. Smithsn. Contr. Zool. 193: 42 (floral relationships).

**excurrans** Cockerell. Colo., N. Mex. Pollen: Unknown, but visits flowers of *Chrysothamnus wrightii*, *Verbesina encelioides*.

*Xenoglossodes excurrans* Cockerell, 1903. Ann. and Mag. Nat. Hist. (7) 12: 448. ♀.

Taxonomy: Cockerell, 1910. Ann. and Mag. Nat. Hist. (8) 5: 259. —Cockerell, 1923. Ent. News 34: 50.

**gutierreziae** Cockerell. N. Mex. Pollen: Unknown, but visits flowers of *Gutierrezia*.

*Xenoglossides gutierreziae* Cockerell, 1905. Ann. and Mag. Nat. Hist. (7) 16: 218. ♀.

**habrocoma** Cockerell. Tex.

*Xenoglossodes habrocoma* Cockerell, 1935. Amer. Mus. Novitates 766: 7. ♂, ♀.

**helianthorum** Cockerell. Tex. Pollen: Unknown, but visits flowers of *Helianthus*.

*Xenoglossodes helianthorum* Cockerell, 1914. Canad. Ent. 46: 415. ♂.

**imitatrix** Cockerell and Porter. N. Mex. Pollen: Unknown, but visits flowers of *Sphaeralcea lobata*.

*Xenoglossodes imitatrix* Cockerell and Porter, 1899. Ann. and Mag. Nat. Hist. (7) 4: 407. ♂, ♀.

**lippiae** (Cockerell). N. Mex., Ariz. Pollen: Unknown, but visits flowers of *Lippia wrightii*, *Phacelia congesta*.

*Synhalonia crenulaticornis lippiae* Cockerell, 1904. Ann. and Mag. Nat. Hist. (7) 14: 25. ♂.

Taxonomy: Cockerell, 1905. Ann. and Mag. Nat. Hist. (7) 16: 224. ♀.

**lippiæ semilippiæ** (Cockerell). Ariz.*Synhalonia lippiae semilippiæ* Cockerell, 1905. Biol. Soc. Wash., Proc. 18: 179. ♀.**neotomæ** Cockerell. N. Mex.*Xenoglossodes neotomæ* Cockerell, 1906. Amer. Ent. Soc., Trans. 32: 314. ♀, ♂.**pallidicauda** Cockerell. Tex.*Xenoglossodes pallidicauda* Cockerell, 1934. Amer. Mus. Novitates 697: 11. ♀.**parksii** (Cockerell). Tex. (vicinity of San Antonio). Pollen: Unknown, but visits flowers of *Convolvulus hermannioides*.*Melissodes agilis* var. *parksii* Cockerell, 1935. Amer. Mus. Novitates 766: 5. ♂.**pimella** (Cockerell). Ariz.*Melissodes pimella* Cockerell, 1906. Ann. and Mag. Nat. Hist. (7) 17: 363. ♂.**pomona** (Cockerell). Calif. (cismontane). Pollen: Possibly an oligolege of *Hemizonia* including *H. fasciculata*, *H. parryi*, *H. virgata*.*Tetralonia pomonæ* Cockerell, 1915. Pomona Jour. Ent. Zool. 7: 230. ♂.*Tetralonia pomona* (!) Cockerell, 1930. Ann. and Mag. Nat. Hist. (10) 5: 410.**spissa** (Cresson). Colo., Tex.*Melissodes spissa* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 280. ♀.**wilmattæ** Cockerell. Tex.*Xenoglossodes wilmattæ* Cockerell, 1917. In W. P. Cockerell, N. Y. Ent. Soc., Jour. 25: 191. ♀.**Genus PEONAPIS** Robertson

Although the genus *Peponapis* is present in both North and South America, different species occupy each continent, and while these faunas are in near geographic contact in the Panamanian-Colombian region they are evidently isolated from one another. Like the bees of the genus *Xenoglossa*, they are solely dependent upon the pollen and to a large extent upon the nectar of both cultivated and uncultivated *Cucurbita* (squashes, gourds and pumpkins). Also as in *Xenoglossa*, the males commonly spend most of the day and a good part of the night in the wilted and closed flowers of these plants. It is not unusual to encounter females at the beginning of the nesting season in the wilted and closed flowers. One species, *Peponapis pruinosa* (Say) has been introduced into Hawaii (Oahu and Hawaii), but it is not known whether the species has become successfully established. The pollen collecting devices of these bees are species-specific and apparently this has influenced the ability of the different species to collect and utilize pollens of the various *Cucurbita*, both wild and domestic. At least several of the species have extended their ranges well beyond their original distribution following the spread and development of cultivated *Cucurbita*. Unquestionably these bees are the most important pollinators of the squashes, gourds and pumpkins.

Revision: Hurd and Linsley, 1964. Hilgardia 35: 425-472, figs. 1, 2, 12-18 (U. S. spp.). — Hurd and Linsley, 1966. Ent. Soc. Amer., Ann. 59: 835-851, 12 figs., 1 table, 8 maps (U. S. and Mexican spp.). — Hurd and Linsley, 1970. Calif. Univ. Pubs. Ent. 62: 1-39, 11 figs., 4 tables, 3 maps (classification).

Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 244-246, fig. 72 (eastern U. S. sp.). — Rozen, 1965. Amer. Mus. Novitates 2233: 6, 11, figs. 20-27 (larva).

Biology: Michelbacher, Smith and Hurd, 1964. Calif. Agr. 18: 2-4, figs. (pollination of squashes, gourds and pumpkins). — Hurd and Linsley, 1964. Hilgardia 35: 376-382, 2 tables (biol. summary). — Michelbacher, Hurd and Linsley, 1968. Bee World 49: 159-167, 6 figs. (feasibility of introducing squash bees into the Old World). — Hurd, Linsley and Whitaker, 1971. Evolution 25: 218-234, 4 figs., 3 tables (squash bees and origin of cultivated *Cucurbita*). — Michelbacher, Hurd and Linsley, 1971. Bee World 52: 156-166, 4 figs. (experimental introduction of squash bees to improve yields of squashes, gourds and pumpkins).

**Genus PEONAPIS** Subgenus **EOPEONAPIS** Hurd and Linsley*Peponapis* subg. *Eopeponapis* Hurd and Linsley, 1970. Calif. Univ. Pubs. Ent. 62: 20.Type-species: *Xenoglossa utahensis* Cockerell. Orig. design.

**michelbacherorum** Hurd and Linsley. South Ariz.; Mexico (Nayarit, Sinaloa and Sonora).

Pollen: Oligolectic on uncultivated mesophytic *Cucurbita*, viz., *Lundelliana* and *Sororia* groups, as well as most, if not all, domestic *Cucurbita* grown within its range.

*Peponapis michelbacherorum* Hurd and Linsley, 1964. *Hilgardia* 35: 437, fig. 14. ♂, ♀.

**utahensis** (Cockerell). Ariz., N. Mex., Tex., ?Utah; Mexico to Costa Rica. Pollen: Oligolectic on uncultivated, mesophytic *Cucurbita*, viz., *Lundelliana* and *Sororia* groups, as well as most, if not all, domestic *Cucurbita* grown within its range. The species was described from a specimen collected prior to the admission of Arizona and New Mexico into the Union and there is a possibility that it had been collected even before Utah gained statehood. Thus the northernmost contemporary record of the species from Tempe, Arizona may be as far north as the species occurs.

*Xenoglossa utahensis* Cockerell, 1905. *Biol. Soc. Wash.*, Proc. 18: 182. ♀.

### Genus PEPONAPIS Subgenus PEPONAPIS Robertson

*Peponapis* Robertson, 1902. *Canad. Ent.* 34: 324.

Type-species: *Macrocera pruinosa* Say. Orig. desig.

#### PRUINOSA SPECIES GROUP

**limitaris** (Cockerell). South. Tex.; Mexico to Panama. Pollen: Oligolectic on uncultivated, mesophytic *Cucurbita* including *C. fraterna* and *C. martinensis*, as well as most, if not all, domestic *Cucurbita*.

*Xenoglossa pruinosa limitaris* Cockerell, 1906. *Ann. and Mag. Nat. Hist.* (7) 18: 73. ♂.

*Tetralonia tenuifasciata* Friese, 1916. *Stettin. Ent. Ztg.* 77: 295, 332. ♀, ♂. Preocc.

*Tetralonia tenuimarginata* Friese, 1921. *Stettin. Ent. Ztg.* 82: 75, 78. N. name.

**pruinosa** (Say). Maine to Ga., west to Idaho and Calif.; Mexico (Central Plateau and west coast, south to Oaxaca). Pollen: Oligolectic on uncultivated xerophytic *Cucurbita* including *C. foetidissima* and *C. galleotti* as well as most, if not all, domestic *Cucurbita*. The geographic range of the species has been significantly expanded following the development and widespread cultivation of domestic *Cucurbita*. The species has been introduced into Hawaii (Oahu and Hawaii), but it is not known whether it has become established. Attempts have also been made to introduce this species into New Zealand, but so far these have been unsuccessful.

*Macrocera pruinosa* Say, 1837. *Boston Jour. Nat. Hist.* 1: 405. ♂, ♀.

*Xenoglossa spruina* Howard, 1901. *Insect Book*, Pl. VIII, fig. 2. ♂. *Lapsus calami*.

*Xenoglossa angelica* Cockerell, 1902. *Ent. News* 13: 103. ♂, ♀.

*Xenoglossa (Peponapis) howardi* Cockerell, 1918. *Ann. and Mag. Nat. Hist.* (9) 2: 420. ♂, ♀.

*Xenoglossa pruinosa* var. *lutzi* Cockerell, 1923. *Canad. Ent.* 55: 205. ♀, ♂.

Biology: Rau, 1922. *Acad. Sci. St. Louis, Trans.* 24 (7): 34. — Mathewson, 1968. *Kansas Ent. Soc., Jour.* 41: 255-261, 1 fig. (nest construction and life history). — Michelbacher, Hurd and Linsley, 1971. *Bee World* 52: 156-166, 4 figs. (experimental introductions). — Hurd, Linsley and Michelbacher, 1974. *Smithsn. Contrib. Zool.* 168: 1-17, 4 figs., 8 tables (nat. history).

Morphology: Mathewson, 1965. *Kans. Ent. Soc., Jour.* 28: 209-233, 25 figs. (internal).

### Genus PEPONAPIS Subgenus XEROPEPONAPIS Hurd and Linsley

*Peponapis* subg. *Xeropeponapis* Hurd and Linsley, 1970. *Calif. Univ. Pubs. Ent.* 62: 28.

Type-species: *Peponapis timberlakei* Hurd and Linsley. Monotypic and orig. desig.

**tiberlakei** Hurd and Linsley. Deserts, N. Mex. to Calif., Nev.; Mexico (Baja California and Sonora). Pollen: Oligolectic on uncultivated, xerophytic *Cucurbita* including *C. digitata* and *C. palmata* of the *Digitata* group. There is no evidence that the species collects pollen from either the xerophytic *C. foetidissima* or domestic *Cucurbita* even though some specimens including females have been collected in these flowers.

*Peponapis timberlakei* Hurd and Linsley, 1964. *Hilgardia* 35: 428, figs. 2, 12. ♂, ♀.

### Genus PEPONAPIS Subgenus XENOPEPONAPIS Hurd and Linsley

*Peponapis* subg. *Xenopeponapis* Hurd and Linsley, 1970. *Calif. Univ. Pubs. Ent.* 62: 29.

Type-species: *Melissodes crassidentata* Cockerell. Monotypic and orig. desig. *crassidentata* (Cockerell). Southern Tex.; Mexico to Costa Rica. Pollen: Oligolectic on uncultivated *Cucurbita* including *C. gracilior*, *C. kellyana*, *C. lundelliana*, *C. martinuzzi*, *C. radicans*, and *C. sororia* as well as most, if not all, domestic *Cucurbita*. *Melissodes crassidentata* Cockerell, 1949. U. S. Natl. Mus., Proc. 98: 466. ♂.

### Genus MELISSODES Latreille

This large genus, which although present in both North and South America as well as the West Indies, is especially well represented by numerous species in North America. Of the eight currently recognized subgenera only the subgenus *Epectica* does not extend into America north of Mexico.

Revision: LaBerge, 1956. Kans. Univ. Sci. Bul. 37: 1032-1194, 129 figs. (Pt. I of a gen. rev. of North and Centr. Amer. spp.). — LaBerge, 1956. Kans. Univ. Sci. Bul. 38: 533-578, 13 figs. (Pt. II of a gen. rev. treating the subgenera *Tachymelissodes*, *Apomelissodes*, *Psilomelissodes*, *Helimelissodes*). — LaBerge, 1961. Kans. Univ. Sci. Bul. 42: 283-663, 125 figs. (Pt. III (final) of a gen. rev. treating the subgenera *Callimelissodes* and *Eumelissodes*).

Taxonomy: Robertson, 1905. Amer. Ent. Soc., Trans. 31: 367-371 (Illinois species). — Cockerell, 1905. Ann. and Mag. Nat. Hist. (7) 15: 521-522 (large species). — Cockerell, 1906. Amer. Ent. Soc., Trans. 32: 74-92. — Michener, 1953. Kans. Univ. Sci. Bul. 35: 1073, figs. 199-205 (larva). — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 263-310, figs. 67-85, 1 table (eastern U. S. spp.). — LaBerge, 1963. Nebr. Univ. State Mus., Bul. 4: 227-242 (geogr. records, n. spp., floral information).

### Genus MELISSODES Subgenus MELISSODES Latreille

*Melissodes* Latreille, 1829. In Cuvier, Regne Animal, ed. 2, v. 5, p. 354.

Type-species: *Melissodes fonscolombei* Romand. First included species, 1841.

*Melissoda* Drapiez, 1841. Dict. Classique Sci. Nat., v. 4, p. 241. Emend. Preocc.

*bimaculata bimaculata* (Lepeletier). Maine west to east. N. Dak. and Colo., south to north. Fla. and east. Tex. Parasite: *Tripeolus lunatus concolor* Robt. Pollen: Unknown, but visits flowers of *Abutilon theophrasti*, *Agastache nepetoides*, *Althaea rosea*, *Arctium minus*, *Asclepias tuberosa*, *A. verticillata*, *Asparagus*, *Aster novae-angliae*, *A. paniculata*, *Astragalus canadensis*, *Baptisia tinctoria*, *Bidens aristosa*, *Blephilia hirsuta*, *Brauneria purpurea*, *Cacalia reniformis*, *Campanula americana*, *C. rotundifolia*, *Cassia fasciculata*, *Cephalanthus occidentalis*, *Cicuta maculata*, *Cirsium lanceolatum*, *Convolvulus sepium*, *Cuphea petiolata*, *Cucurbita pepo*, *Dalea onobrychis*, *Desmodium bracteosum*, *D. canadense*, *D. dillenii*, *D. paniculatum*, *Dianthera americana*, *Dipsacus sylvestris*, *Echinocystis lobata*, *Eupatorium coelestinum*, *Gaura biennis*, *Gerardia grandiflora*, *Gladiolus*, *Gossypium herbaceum*, *Grindelia*, *Helenium autumnale*, *Helianthus annuus*, *H. divaricatus*, *H. grosse-serratus*, *H. tuberosus*, *Hibiscus lasiocarpus*, *H. militaris*, *Impatiens biflora*, *Ipomoea pandurata*, *I. purpurea*, *Jacquemontia tenuifolia*, *Lepachys pinnata*, *Lespedeza procumbens*, *Lobelia leptostachys*, *L. siphilitica*, *Lythrum alatum*, *Malva rotundifolia*, *M. sylvestris*, *Medicago sativa*, *Melilotus alba*, *M. officinale*, *Mentha*, *Monarda fistulosa*, *M. mollis*, *M. punctata*, *Nepeta cataria*, *Oenothera biennis*, *Oxalis stricta*, *Petalostemon purpureum*, *Petunia*, *Phytostegia virginiana*, *Platycodon grandiflorum*, *Polygonum pennsylvanicum*, *Prunella vulgaris*, *Pycnanthemum flexuosum*, *Ratibida*, *Rhus copallina*, *Rudbeckia triloba*, *Sagittaria*, *Scrophularia marilandica*, *Scutellaria lateriflora*, *Seymeria macrophylla*, *Sicyos angulatus*, *Silphium laciniatum*, *S. perfoliatum*, *Sisyrinchia*, *Solidago*, *Stachys palustris*, *Strophostylis*, *Symphoricarpos occidentalis*, *S. orbiculata*, *Teucrium canadense*, *Trifolium pratense*, *Verbena hastata*, *V. stricta*, *V. urticaefolia*, *V. baldwini interior*, *Vernonia fasciculata*, *V. spicata*, *Veronica virginica*, *Vitex agnus-castus*.

*Macrocera bimaculata* Lepeletier, 1825. Encycl. Method. Ins., v. 10, p. 528. ♀.

*Macrocera binotata* Say, 1837. Boston Jour. Nat. Hist. 1: 404. ♀, ♂.

*Macrocera nigra* Lepeletier, 1841. Hist. Nat. Ins., Hym., v. 2, p. 112. ♂.

*Melissodes melanosoma* Cockerell, 1905. *Canad. Ent.* 37: 266. ♂.

Biology: Ashmead, 1894. *Psyche* 7: 25 (nest). — Banks, 1902. *N. Y. Ent. Soc., Jour.* 10: 209 (nest). — Folsom, 1922. *Ent. Soc. Amer., Ann.* 15: 183 (nest). — Rau, 1922. *Acad. Sci. St. Louis, Trans.* 24: 34 (nest).

**bimaculata nulla** LaBerge. South. Fla. and Keys. Pollen: Unknown, but visits flowers of *Lythrum lineare*.

*Melissodes (Melissodes) bimaculata nulla* LaBerge, 1956. *Kans. Univ. Sci. Bul.* 37: 1109. ♂, ♀.

**blanda** LaBerge. Tex., Okla. Pollen: Unknown, but visits flowers of *Borreria frutescens*, *Gaillardia*, *Opuntia*, *Sphaeralcea*.

*Melissodes (Melissodes) blanda* LaBerge, 1956. *Kans. Univ. Sci. Bul.* 37: 1084. ♂, ♀.

**collicata** Cockerell. Ariz., Mexico (Chihuahua, Durango, Jalisco, Zacatecas, Puebla, Michoacan, Oaxaca). Pollen: Unknown, but visits flowers of *Asclepias*, *Baccharis glutinosa*, *Gutierrezia*.

*Melissodes collicata* Cockerell, 1910. *Ann. and Mag. Nat. Hist.* (8) 5: 257. ♂.

*Melissodes (Melissodes) elusa* LaBerge, 1956. *Kans. Univ. Sci. Bul.* 37: 1061. ♂, ♀.

Taxonomy: LaBerge, 1961. *Kans. Univ. Sci. Bul.* 42: 655 (synonymy). — LaBerge, 1963. *Nebr. Univ. State Mus., Bul.* 4: 234-235 (geogr. records).

**communis alopec** Cockerell. South. Calif. to B. C., east to Alta. and Utah. Pollen: Unknown, but visits flowers of *Asclepias erosa*, *Cirsium*, *Clarkia amoena*, *C. elegans*, *Cryptantha intermedia*, *Datura meteloides*, *Durandtia plumieri*, *Encelia californica*, *Eriodictyon trichocalyz*, *Eriogonum fasciculatum polifolium*, *Gilia capitata*, *Grindelia camporum*, *Hugelia virgata*, *Lotus scoparius*, *Malvastrum fasciculatum*, *Medicago sativa*, *Melilotus*, *Mesembryanthemum crystallinum*, *Monardella lanceolata*, *Opuntia littoralis*, *Penstemon*, *Phacelia ramosissima*, *Salvia opiana*, *S. carnosa*, *S. clevelandii*, *Scabiosa*, *Sphaeralcea fasciculata*, *Stachys apargioides*, *Stephanomeria exigua*, *Trifolium involucreata*.

*Melissodes alopec* Cockerell, 1928. *Psyche* 35: 233. ♂.

**communis communis** Cresson. Southeastern Ariz., north through eastern Colo. and Wyo. to N. Dak. and east through Ill. and Ind. in the north and through Tex. in the south to the Atlantic. Pollen: Polylectic, appears to prefer pollen from flowers of Leguminosae and Labiatae, but visits a wide variety of flowers including *Abutilon theophrasti*, *Althaea rosea*, *Amorpha*, *Asclepias syriaca*, *A. tuberosa*, *Baptisia*, *Befaria racemosa*, *Blephilia hirsuta*, *Brazoria truncata*, *Campanula*, *Cassia fasciculata*, *Chrysopsis*, *angustifolia*, *Cirsium discolor*, *C. lanceolatum*, *Cleome serrulata*, *Convolvulus*, *Croton*, *Cucurbita*, *Cyrtilla parviflora*, *Dalea multiflora*, *Dianthera americana*, *Echium vulgare*, *Gossypium herbaceum*, *Grindelia*, *Helenium tenuifolium*, *Helianthus annuus*, *H. lenticularis*, *Heliotropium*, *Hyrta*, *Ipomoea*, *Lactuca*, *Lythrum alatum*, *L. lineare*, *Malva sylvestris*, *Medicago sativa*, *Melilotus alba*, *Mentha*, *Monarda citriodora*, *M. fistulosa*, *M. pectinata*, *M. punctata*, *Nepeta cataria*, *Oenothera elliptica*, *O. laciniata*, *Opuntia*, *Passiflora incarnata*, *Petalostemon occidentale*, *P. purpureum*, *P. violaceum*, *Phaseolus*, *Platycodon grandiflorum*, *Prionopsis*, *Proboscidea louisianica*, *Pycnanthemum flexuosum*, *Ratibida columnifera*, *Rudbeckia*, *Rhus glabra*, *Salvia*, *Sidalcea reticulata*, *Solanum elaeagnifolium*, *Solidago serotina*, *Teucrium canadense*, *Thelesperma megapotamicum*, *Verbena stricta*, *Vernonia baldwinii interior*, *V. glauca*.

*Melissodes communis* Cresson, 1878. *Acad. Nat. Sci. Phila., Proc.* 30: 204. ♀, ♂.

*Melissodes hortivagans* Cockerell, 1905. *Biol. Soc. Wash., Proc.* 18: 180. ♂, ♀.

*Melissodes Martini* Cockerell, 1905. *Ann. and Mag. Nat. Hist.* (7) 15: 526. ♀.

*Melissodes variabilis* Robertson, 1905. *Amer. Ent. Soc., Trans.* 31: 368. ♀, ♂.

*Melissodes xanthopteralis* Cockerell, 1906. *Ann. and Mag. Nat. Hist.* (7) 17: 362. ♂.

*Melissodes manni* Cockerell, 1924. *Amer. Mus. Novitates* 113: 1. ♂.

*Melissodes hortivagans melanotica* Cockerell, 1925. *Ann. and Mag. Nat. Hist.* (9) 16: 231. ♀.

**comptoides** Robertson. N. J. to Fla., west to S. Dak., Colo., Ariz. Pollen: Polylectic, appears to prefer pollen of *Euphorbia marginata*, *Medicago sativa* and *Melilotus alba*, but visits other flowers including *Amphichyris dracunculoides*, *Asclepias racematus*, *Aster*,



*Blephilia hirsuta*, *Campanula americana*, *Cassia fasciculata*, *Cleome serrulata*, *Cicuta maculata*, *Cirsium lanceolatum*, *Diodea teres*, *Gossypium herbaceum*, *Helenium tenuifolium*, *Helianthus annuus*, *H. petiolaris*, *Lepachys pinnata*, *Lespedeza virginica*, *Ludwigia alternifolia*, *Lycopus americanus*, *Lythrum alatum*, *L. lineare*, *L. salicaria*, *Monarda citriodora*, *M. fistulosa*, *M. punctata*, *Petalostemon purpureum*, *Prunella vulgaris*, *Peccanthemum flexuosum*, *P. pilosum*, *P. virginicum*, *Ratibida*, *Solidago serotina*, *Symphoricarpos*, *Taxaracum officinale*, *Teucrium canadense*, *Verbena hastata*, *V. stricta*, *Vernonia fasciculata*, *V. longifolia*, *V. noveboracensis*.

*Melissodes comptoides* Robertson, 1898. Acad. Sci. St. Louis, Trans. 8: 52. ♀, ♂.

*Melissodes martini hitei* Cockerell, 1908. Ann. and Mag. Nat. Hist. (8) 2: 331. ♀.

**gilensis gilensis** Cockerell. Ariz., N. Mex., Colo. Pollen: Polylectic, visits flowers of *Arabis*, *Asclepias tuberosa*, *Cercidium torreyanum*, *Cirsium*, *Lippia lyciddeae*, *Lotus brightii*, *Lupinus*, *Malva*, *Melilotus alba*, *M. officinalis*, *Monarda menthaefolia*, *M. stricta*, *Nolina*, *Robinia neomexicana*. Another subspecies, *Melissodes gilensis crenata* LaBerge, occurs in Mexico.

*Melissodes gilensis* Cockerell, 1896. Entomologist 29: 306. ♀, ♂.

*Melissodes epicharina* Cockerell, 1905. Psyche 12: 99. ♀.

**maesta** LaBerge. Tex.; Mexico (Coahuila, San Luis Potosi and Zacatecas). Pollen: Unknown, but visits flowers of *Helenium*, *Monarda citriodora*, *Phacelia*.

*Melissodes (Melissodes) maesta* LaBerge, 1956. Kans. Univ. Sci. Bul. 37: 1095. ♂, ♀.

**parosetae** Cockerell. South. Calif. to southwest. Tex.; Mexico (Baja Calif., Sonora, Chihuahua, Nayarit). Pollen: Polylectic, visits flowers of *Acacia greggii*, *Argemone*, *Asclepias subulata*, *Aster canescens*, *Cucurbita*, *Cleome luteum*, *Dalea albifrons*, *Dasyliiron wheeleri*, *Eriogonum trichopes*, *Franseria eriocentra*, *Gaillardia*, *Gossypium herbaceum*, *Haplopappus heterophylla*, *Helianthus annuus*, *Heterotheca subaxillaris*, *Kallstroemia grandiflora*, *Larrea tridentata*, *Leucophyllum frutescens*, *Lippia*, *Lygodesmia juncea*, *Medicago sativa*, *Opuntia*, *Parosela scoparia*, *Pectis papposa*, *Petalostemon*, *Prosopis glandulosa*, *Psilostrophe cooperi*, *Pyrrhopappus multicaulis*, *Rhus*, *Salix*, *Senecio longilobus*, *Thurberia thespesioides*, *Verbesina encelioides*, *V. exauriculata*, *Wedelia incarnata*, *Wislizenia palmeri*, *W. refracta*, *Zinnia grandiflora*.

*Melissodes parosetae* Cockerell, 1905. Ann. and Mag. Nat. Hist. (7) 15: 528. ♂.

*Melissodes parosetae* Cockerell, 1905. Ann. and Mag. Nat. Hist. (7) 16: 477. Justified emendation of *parosetae*.

*Melissodes Helenae* Cockerell, 1906. Ann. and Mag. Nat. Hist. (7) 17: 365. ♀.

*Melissodes communis gratior* Cockerell, 1923. Calif. Acad. Sci., Proc. 12: 85. ♀.

**Biology:** Mathewson and Daly, 1955. Kans. Ent. Soc., Jour. 28: 120. — Linsley, 1962, Ent. Soc. Amer., Ann. 55: 161, fig. 8. — Butler, Todd, McGregor and Werner, 1962. Ariz. Univ. Agr. Expt. Sta. Tech. Bul. 139: 1-11. — Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 41 (floral relationships with *Larrea*).

**tepaneca** Cresson. Kans., Ill. and N. C. south through Tex. and Mexico to Panama. Pollen: Polylectic, visits flowers of *Abutilon avicennes*, *A. theophrasti*, *Agastache breviflora*, *Asclepias syriaca*, *A. tuberosa*, *Aster tanacetifolium*, *Baccharis*, *Borrchia frutescens*, *Brazoria truncata*, *Callirhoe involucrata*, *Cephalanthus occidentalis*, *Cercidium texanum*, *Coreopsis palmata*, *Cornuta grandiflora*, *Cuphea balsamona*, *Dalea grisea*, *Davilla knuthii*, *Donnellsmithia hintonii*, *Eryngium leavenworthii*, *Eysenhardtia polystachya*, *Gaillardia suavis*, *Gossypium herbaceum*, *Grindelia*, *Helenium microcephalum*, *Hibiscus tiliaceus*, *Ipomoea longifolia*, *I. muricoides*, *I. triloba*, *Lactuca pulchella*, *Lindheimeria texana*, *Lippia*, *Lythrum alatum*, *L. lanceolatum*, *Marrubium vulgare*, *Medicago*, *Monarda punctata*, *Opuntia lindheimeri*, *Parkinsonia*, *Petalostemon multiflorum*, *P. purpureum*, *P. violaceum*, *Phacelia*, *Phlox*, *Prosopis*, *Ratibida columnifera pulcherrima*, *Rubus*, *Rudbeckia*, *Salvia*, *Sida acuta*, *Sphaeralcea*, *Sisyrinchium campestre*, *Teucrium canadense*, *Verbesina encelioides*, *Verbena officinalis*, *V. stricta*, *Vernonia aschenborniana*.

*Melissodes tapaneca* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 210. ♀ in part (♂ misdet.).

*Melissodes petalostemonis* Robertson, 1900. Acad. Sci. St. Louis, Trans. 10: 53. ♀.

*Melissodes galvestonensis* Cockerell, 1905. Biol. Soc. Wash., Proc. 18: 181. ♀, ♂.

*Melissodes bruesi* Cockerell, 1906. Amer. Ent. Soc., Trans. 32: 110. ♀.

*Melissodes loena* Cockerell, 1909. Entomologist 42: 148. ♂.

*Melissodes masuca* Cockerell, 1909. Entomologist 42: 148. ♂.

*Melissodes tepaneca aschenborniana* Cockerell, 1912. Ann. and Mag. Nat. Hist. (8) 10: 28. ♂.

*Melissodes aurescens* Cockerell, 1949. U. S. Natl. Mus., Proc. 98: 462. ♀.

**tepida tepida** Cresson. North. Utah to Calif. (Sierra Nevada Mts.), north to south. Idaho and northwest. Oreg. Pollen: Presumably polylectic, visits flowers of *Asclepias*, *Astragalus bolanderi*, *Glycyrrhiza lepidota*, *Helianthus annuus*, *Medicago sativa*, *Melilotus*, *Mentha*, *Trifolium pratense*.

*Melissodes tepida* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 210. ♀.

**tepida timberlakei** Cockerell. South. Calif. northeast to Sierra Mts., north to southern Oreg. west of Sierras. Parasite: *Triepeolus lineatulus* Ckll. and Sandh., *T. timberlakei* Ckll. Pollen: Polylectic, visits the flowers of many species of plants for pollen and or nectar evidently preferring the pollen of Leguminosae, Labiatae, Euphorbiaceae, but also visits *Althaea rosea*, *Artemisia*, *Asclepias eriocarpa*, *Aster*, *Bellis*, *Brassica adpressa*, *B. geniculata*, *B. incana*, *Centaurea cyanus*, *Centromadia pungens*, *Chrysanthemum*, *Clarkia amoena*, *Cleomella*, *Coreopsis lanceolata*, *Croton californicus*, *Cryptantha intermedia*, *Cucurbita*, *Daucus carota*, *Durantia plumieri*, *Eremocarpus setigerus*, *Eriastrum virgatum*, *Eriogonum fasciculatum*, *E. gracile*, *E. involucratum*, *Eschscholzia californica*, *Geranium*, *Gilia capitata*, *Gossypium*, *Gutierrezia californica*, *G. sarothrae*, *Helianthus annuus*, *H. bolanderi*, *H. petiolaris*, *Heliotropium curassavicum*, *Hemizonia pungens*, *Hugelia virgata*, *Ipomoea*, *Lippia filiformis*, *L. lanceolata*, *Lotus americanus*, *L. scoparius*, *Madia*, *Marrubium vulgare*, *Medicago sativa*, *Melilotus alba*, *M. indica*, *Mesembryanthemum crystallinum*, *Papaver heterophyllum*, *Phacelia ramosissima*, *Phaseolus*, *Phyla lanceolata*, *P. nodiflora rosea*, *Plantago bigelovii*, *Pluchea borealis*, *P. camphorata*, *P. sericea*, *Raphanus*, *Rosa*, *Salsola kali*, *Scabiosa*, *Senecio douglasii*, *Sicyos*, *Sida hederacea*, *Stachys ajugoides*, *S. bullata*, *Stephanomeria exigua*, *S. virgata*, *Trichostema lanceolatum*, *Trifolium involucratum*, *T. repens*, *Wislizenia refracta*.

*Melissodes timberlakei* Cockerell, 1926. Ann. and Mag. Nat. Hist. (9) 18: 624. ♀.

Biology: Linsley, 1946. Econ. Ent., Jour. 39: 20-23, 25 (nesting habits).

**tepida yumensis** LaBerge. Southeast. Calif., south. Nev., southwest. Utah, Ariz.; Mexico (Baja Calif.). Pollen: Polylectic, visiting flowers of *Aster spinosa*, *Cercidium torreyanum*, *Chilopsis linearis*, *Citrullus*, *Cynodon dactylon*, *Gossypium*, *Lippia brevipes*, *Medicago sativa*, *Melilotus alba*, *Phyla nodiflora*, *Pluchea*, *Salix*, *Sida hederacea*, *Sphaeralcea orcutti*, *Tamarix gallica*.

*Melissodes (Melissodes) tepida yumensis* LaBerge, 1956. Kans. Univ. Sci. Bul. 37: 1128. ♂, ♀.

Biology: Butler, Todd, McGregor and Werner, 1962. Ariz. Univ. Agr. Expt. Sta. Tech. Bul. 139: 1-11 (floral relationships).

**tessellata** LaBerge. South. coastal Calif.; Mexico (Baja Calif., Jalisco). Pollen: Polylectic, visits a wide variety of flowers for pollen and or nectar including *Acacia greggii*, *Asclepias erosa*, *Baccharis glutinosa*, *Bebbia juncea*, *Brassica geniculata*, *Centaurea melitensis*, *Chrysanthemum segetum*, *Chrysothamnus veganus*, *Clarkia amoena*, *C. elegans*, *Corethrogyne bernardina*, *C. filaginifolia*, *Croton californicus*, *Cucurbita foetidissima*, *Durantia plumieri*, *Encelia farinosa*, *Eriogonum fasciculatum*, *Gutierrezia bernardina*, *G. californica*, *G. sarothrae*, *Haplopappus palmeri*, *H. vernonioides*, *Helianthus annuus*, *Hemizonia fasciculatum*, *H. paniculata*, *Hugelia virgata*, *Lippia filiformis*, *Lotus scoparius*, *Malvastrum fasciculatum*, *Marrubium vulgare*, *Medicago sativa*, *Melilotus alba*, *Monardella villosa*, *Opuntia parryi*, *Parkinsonia aculeata*, *Pluchea camphorata*, *Polygonum lapathifolium*, *Salvia apiana*, *Senecio douglasii*, *Stephanomeria virgata*, *Trichostema lanceolatum*, *Wislizenia refracta*.

*Melissodes (Melissodes) tessellata* LaBerge, 1956. Kans. Univ. Sci. Bul. 37: 1157, figs. 101-103. ♂, ♀.

**thelypodii** *thelypodii* Cockerell. West Tex. to southeast. Calif.; Mexico (Chihuahua, Coahuila, Durango). Pollen: Polylectic, takes pollen from a wide variety of plants including *Carthamus*, *Gossypium*, *Kallstroemia grandiflora*, but also visits the flowers of *Asclepias*, *Astragalus cottonii*, *Baccharis glutinosa*, *Chamaesaracha coronopus*, *Cirsium*, *Convolvulus*, *Gaillardia*, *Helianthus annuus*, *Hoffmanseggia jamesii*, *Ipomoea mexicana*, *Larrea tridentata*, *Lippia cuneifolia*, *Lygodesmia juncea*, *Medicago sativa*, *Melilotus*, *Solanum elaeagnifolium*, *Sphaeralcea*, *Thelypodium linearifolium*, *Thurberia thespesioides*, *Weddellia incarnata*. Another subspecies, *Melissodes thelypodii stultia* LaBerge, occurs in Mexico (Colima, Durango, Jalisco, Michoacan, Oaxaca and San Luis Potosi), Guatemala and Honduras.

*Melissodes thelypodii* Cockerell, 1905. Ann. and Mag. Nat. Hist. (7) 15: 527. ♀.

*Melissodes kallstroemiae* Cockerell, 1905. Ann. and Mag. Nat. Hist. (7) 16: 216. ♂.

*Melissodes kallstroemiae* var. *phenacoides* Cockerell, 1905. Ann. and Mag. Nat. Hist. (7) 16: 217. ♂.

*Melissodes thurberiae* Cockerell, 1914. Ent. Soc. Wash., Proc. 16: 31. ♀.

Biology: Butler, Todd, McGregor and Werner, 1962. Ariz. Univ. Agr. Expt. Sta. Tech. Bul. 139: 1-11. —Cazier and Linsley, 1974. Amer. Mus. Novitates 2546: 14 (floral relationships).

### Genus MELISSODES Subgenus APOMELISSODES LaBerge

*Melissodes* subg. *Apomelissodes* LaBerge, 1956. Kans. Univ. Sci. Bul. 37: 1175.

Type-species: *Melissodes fimbriata* Cresson. Orig. desig.

**apicata** Lovell and Cockerell. Maine to Fla. Pollen: Oligolectic, obtains both pollen and nectar from flowers of *Pontederia*, but visits other flowers for nectar including *Cirsium*, *Hydrocotyle umbellata*, *Melilotus alba*, *Oenothera speciosa*, *Stachys floridana*, *Trifolium hybridum*.

*Melissodes apicata* Lovell and Cockerell, 1906. Psyche 13: 111. ♀.

Taxonomy: LaBerge, 1963. Nebr. Univ. State Mus., Bul. 4: 233-234 (geogr. and floral records).

**baileyi** Cockerell. Tex. Pollen: Unknown, but visits flowers of *Callirhoe* and *Gaillardia*.

*Melissodes Baileyi* Cockerell, 1906. Ann. and Mag. Nat. Hist. (7) 17: 361. ♀.

Taxonomy: LaBerge, 1963. Nebr. Univ. State Mus., Bul. 4: 231-233. ♂ (geogr. and floral records).

**fimbriata** Cresson. Va. to Ga., west to Tex., Kans. Pollen: Oligolectic, obtains both pollen and nectar from flowers of *Oenothera*, but visits other flowers for nectar including *Helianthus petiolaris*, *Kneiffia*.

*Melissodes fimbriata* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 203. ♀, ♂.

**mitchelli** LaBerge. N. C., Ga., Fla. Pollen: Apparently oligolectic, visits flowers of *Opuntia*.

*Melissodes (Apomelissodes) mitchelli* LaBerge, 1956. Kans. Univ. Sci. Bul. 38: 556, fig. 7. ♂, ♀.

### Genus MELISSODES Subgenus HELIOMELISSODES LaBerge

*Melissodes* subg. *Heliomelissodes* LaBerge, 1956. Kans. Univ. Sci. Bul. 37: 1172.

Type-species: *Melissodes desponsa* Smith. Orig. desig.

**desponsa** Smith. N. S. to N. C., Ala., west to N. Dak. and Okla. Pollen: Oligolectic, obtains pollen from flowers of *Cirsium*, but visits other flowers for nectar including *Aster novaeangliae*, *Brauneria purpurea*, *Carduus crispus*, *Cassia*, *Centaurea jacea*, *Coreops aristosa*, *Helianthus annuus*, *H. grosse-serratus*, *Inula helenium*, *Monarda fistulosa*, *Pontederia cordata*, *Pycnanthemum*, *Rudbeckia laciniata*, *Silphium perfoliatum*, *Solidago canadensis*, *S. puberula*, *Verbena stricta*.

*Melissodes desponsa* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 310. ♀.

*Melissodes daponas*(!) Bridwell, 1899. Kans. Acad. Sci., Trans. 16: 211.

*Melissodes nigripes* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 311. ♀ (♂ misdet.).

*Melissodes cnici* Robertson, 1901. Canad. Ent. 33: 230. ♀, ♂.

- rivalis* Cresson. B. C. and Calif. east to Man., Minn., south to Ariz., N. Mex. and Tex. Parasite: *Nemognatha dichroa* LeC.? Pollen: Apparently oligolectic, obtains pollen from composites of the tribe Cynareae, especially the genus *Cirsium*, but visits other flowers presumably for nectar including *Apocynum*, *Asclepias*, *Carduus caulescens*, *Centaurea americana*, *Helianthus annuus*, *Penstemon cyananthus*, *Rudbeckia*, *Solidago*, *Teucrium*, *Trifolium repens*, *T. pratense*, *Verbena*.
- Melissodes rivalis* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 277. ♂.
- Melissodes desponsiformis* Cockerell, 1905. In Viereck, Canad. Ent. 37: 320. ♀.
- Melissodes mysops* Cockerell, 1905. Entomologist 38: 146. ♂, ♀.
- Melissodes hexacantha* Cockerell, 1905. Psyche 12: 100. ♂.
- Melissodes nigrosignata* Cockerell, 1905. Psyche 12: 101. ♀.
- Melissodes habilis* Cockerell, 1925. Ann. and Mag. Nat. Hist. (9) 16: 229. ♂.
- Biology: Scullen, 1928. Pan-Pacific Ent. 4: 176 (as *mysops*, nesting habits). — LaBerge, 1956. Kans. Univ. Sci. Bul. 38: 571-572 (additional information on nesting habits based on notes supplied by H. A. Scullen).

### Genus MELISSODES Subgenus TACHYMELISSODES LaBerge

*Melissodes* subg. *Tachymelissodes* LaBerge, 1956. Kans. Univ. Sci. Bul. 37: 1170.

Type-species: *Melissodes dagosa* Cockerell. Orig. desig.

- dagosa* Cockerell. Idaho and Wash. to Calif. and Colo. Pollen: Unknown, but visits flowers of *Asclepias*, *Cirsium*, *Medicago sativa*, *Melilotus alba*, *Norta altissima*, *Sphaeralcea*, *Thelypodium brachycarpa*.
- Melissodes dagosa* Cockerell, 1909. Canad. Ent. 41: 128. ♂.
- Melissodes calloleuca* Cockerell, 1924. Pan-Pacific Ent. 1: 55. ♀.
- opuntiella* Cockerell. Utah, Calif., Ariz., Tex.; Mexico (Coahuila Mexico and Zacatecas). Pollen: Polylectic, obtains pollen from such flowers as *Cirsium*, *Lindheimera texana*, *Sphaeralcea pedatifolia*, *Verbesina encelioides*, but visits other flowers including *Cercidium texanum*, *Erigeron compositus*, *Helium microcephalum*, *Helianthus annuus*, *Opuntia lindheimeri*, *Parkinsonia*, *Prosopis*, *Tetradymia canescens*.
- Melissodes opuntiella* Cockerell, 1911. Canad. Ent. 43: 131. ♂, ♀.
- Melissodes albocincta* Cockerell, 1919. Ann. and Mag. Nat. Hist. (9) 2: 119. ♀.
- sphaeralceae* Cockerell. Ariz., N. Mex., Tex.; Mexico (Aguascalientes, Distrito Federal, Mexico, San Luis Potosi, Zacatecas). Pollen: Unknown, but visits flowers of *Melilotus alba*, *Monarda*, *Sphaeralcea angustifolia*, *S. fendleri*.
- Melissodes sphaeralceae* Cockerell, 1896. Entomologist 29: 304. ♂.

### Genus MELISSODES Subgenus EUMELISSODES LaBerge

*Melissodes* subg. *Eumelissodes* LaBerge, 1956. Kans. Univ. Sci. Bul. 37: 1177.

Type-species: *Melissodes agilis* Cresson. Orig. desig.

- agilis* Cresson. South. Canada, U. S., except Fla.; Mexico (Chihuahua, Coahuila, Durango). Pollen: Apparently an oligolectic of *Helianthus* including *H. annuus*, *H. atrorubens*, *H. bolanderi*, *H. ciliaris*, *H. coronarius*, *H. divaricatus*, *H. grosse-serratus*, *H. laetiflorus*, *H. lenticularis*, *H. maximillianus*, *H. mollis*, *H. petiolaris*, *H. pumilis*, *H. radulus*, *H. rigidus*, *H. salicifolius*, *H. scaberrimus*, *H. subrhomboides*, *H. tuberosus*, but visits a wide variety of flowers: *Abutilon theophrasti*, *Athaea rosea*, *Aplopappus spinulosus*, *Arctium*, *Argemone platyceras*, *Bidens aristosa*, *B. laevis*, *Blephilia hirsuta*, *Brassica juncea*, *Brauneria pallida*, *Carduus crispus*, *Carya pecan*, *Cassia chamaecrista*, *C. fasciculata*, *Centromadia pungens*, *Chrysopsis hispidus*, *Chrysothamnus*, *Cirsium altissimum*, *C. discolor*, *C. lanceolatum*, *C. undulatum*, *Clematis*, *Cleome lutea*, *C. serrulata*, *Convolvulus*, *Coreopsis lanceolata*, *C. palmata*, *C. tripteris*, *Cosmos*, *Datura meteloides*, *Enceliopsis*, *Engelmannia pinnatifida*, *Ericameria palmeri*, *Eschscholzia californica*, *Eupatorium purpureum*, *Eustoma artemifolium*, *Gaillardia cristata*, *Gilia*, *Grindelia squarrosa*, *Gutierrezia sarothrae*, *Haplopappus palmeri*, *Helium autumnale*, *H. laciniatum*, *Heliopsis*, *Heliotropium*, *Hemizonia pungens*, *Hibiscus*, *Ipomoea*, *Lactuca pulchella*, *Lepachys pinnata*, *Liatris pycnostachya*, *Medicago sativa*, *Melilotus alba*, *Mentha canadensis*, *Monarda fistulosa*, *Penstemon*, *Pepo*, *Petalostemon*.

*occidentale*, *P. purpureum*, *Phacelia*, *Physostegia parviflora*, *Platycodon grandiflorum*, *Pluchea camphorata*, *Prionopsis*, *Pycnanthemum flexuosum*, *P. pilosum*, *Pyrrhopappus multicaulis*, *Rudbeckia hirta*, *R. laciniata*, *R. triloba*, *Schrankia uncinata*, *Senecio*, *Silphium integrifolium*, *S. laciniatum*, *S. perfoliatum*, *S. speciosum*, *Stim. cicutaeifolium*, *Solidago canadensis*, *S. serotina*, *S. trinervata*, *Teucrium canadense*, *Verbena hastata*, *V. stricta*, *Verbesina encelioides*, *V. exauriculata*, *V. occidentalis*, *Vernonia baldwini interior*, *V. baldwini occidentalis*, *V. fasciculata*, *Veronica*, *Viter agnus-castus*, *Wislizenia refracta*.

*Melissodes agilis* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 204. ♂.

*Melissodes aurigenia* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 212. ♀, ♂.

Biology: Rau, 1922. Acad. Sci. St. Louis, Trans. 24 (7): 34 (nest site, burrow). —Custer, 1928. Canad. Ent. 60: 28-31, 2 figs. (possibly this species using same burrow entrance as *Srastra obliqua* Say).

**appressa** LaBerge. Calif. Pollen: Oligolege of autumnal flowering Compositae, especially *Gutierrezia*, *Haplopappus*, *Heterotheca*, but visits other flowers including *Alyssum maritimum*, *Aster exilis*, *Centromadia pungens*, *Croton californicus*, *Grindelia californica*, *G. camporum*, *Helianthus annuus*, *Heliotropium curassavicum*, *H. oculatum*, *Hemizonia pungens*, *Lessingia glandulifera*, *Melilotus alba*, *Phacelia crenulata*, *Pluchea camphorata*, *Senecio*, *Solidago confinis*, *S. occidentalis*.

*Melissodes* (*Eumelissodes*) *appressa* LaBerge, 1961. Kans. Univ. Sci. Bul. 42: 616. ♀, ♂.

**bicolorata** LaBerge. Northern Calif., Nev., Utah. Pollen: Unknown, but visits flowers of *Chrysothamnus*, *Haplopappus arborescens*, *Melilotus*, *Penstemon palmeri*.

*Melissodes* (*Eumelissodes*) *bicolorata* LaBerge, 1961. Kans. Univ. Sci. Bul. 42: 441. ♀, ♂.

**bidentis** Cockerell. N. Dak. and Minn., east to N. Y., south to Tex. Pollen: Apparently an oligolege of Compositae, visits flowers of *Bidens*, *Echinacea pallida*, *Gossypium herbaceum*, *Helianthus annuus*, *H. maximilianus*, *H. tuberosus*, *Physostegia parviflora*, *Rudbeckia laciniata*, *Sonchus terrestris*.

*Melissodes bidentis* Cockerell, 1914. Ann. and Mag. Nat. Hist. (8) 14: 362. ♀.

**bimatrix** LaBerge. B. C. to Calif., east to Colo. and N. Mex. Pollen: Probably oligolectic, obtaining pollen principally from flowers of *Chrysothamnus* including *C. nauseosus*, *C. n. consimilis*, *C. n. gnaphalodes*, *C. n. hololeucus*, *C. n. mohavensis*, *C. n. occidentalis*, *C. n. speciosus*, *C. paniculatus*, *C. parryi*, *C. viridulus*, *C. viscidiflorus viscidiflorus*, and *Haplopappus acradenioides*, *H. arborescens*, *H. palmeri*, but also visits flowers of *Artemisia*, *Aster*, *Bigelovia*, *Centromadia pungens*, *Chaematoris*, *Eriogonum*, *Grindelia camporum*, *Gutierrezia californica*, *G. lucida*, *G. sarothrae*, *Helianthus*, *Rhamnus californica*, *Senecio*.

*Melissodes* (*Eumelissodes*) *bimatrix* LaBerge, 1961. Kans. Univ. Sci. Bul. 42: 431. ♀, ♂.

**boltoniae** Robertson. Pa. to Minn. south to Fla. and Tex. Pollen: Oligolege of Compositae, visiting flowers of *Abutilon avicennae*, *Amphiachyris dracunculoides*, *Aster ericoides villosus*, *A. multiflorus*, *A. novaeangliae*, *A. praecatus*, *Bidens involucrata*, *Boltonia asteroides*, *Cassia*, *Chrysopsis*, *Cirsium*, *Coreopsis aristosa*, *Helenium altissimum*, *H. autumnale*, *H. tenuifolium*, *Helianthus annuus*, *H. grosse-serratus*, *H. tuberosus*, *Heterotheca latifolia*, *Lythrum*, *Ratibida pinnata*, *Rudbeckia triloba*, *Silphium*, *Solidago canadensis*, *S. missouriensis*, *Verbena stricta*, *Vernonia baldwini interior*. In the vicinity of Lawrence, Kansas females have been observed almost invariably collecting pollen from flowers of *Amphiachyris dracunculoides*.

*Melissodes boltoniae* Robertson, 1905. Amer. Ent. Soc., Trans. 31: 368. ♀.

*Melissodes melandri* Cockerell, 1906. Amer. Ent. Soc., Trans. 32: 109. ♀.

**brevipyga** LaBerge. Ariz., Calif., Idaho. Pollen: Oligolege of Compositae, visits flowers of *Aster spinulosus*, *A. tephrodes*, *Baccharis emoryi*, *Chrysothamnus*, *Gutierrezia californica*, *G. sarothrae*, *Haplopappus acradenioides*, *Palafoxia linearis*, *Pectis papposa*.

*Melissodes* (*Eumelissodes*) *brevipyga* LaBerge, 1961. Kans. Univ. Sci. Bul. 42: 606, figs. 111-112. ♀, ♂.

**cerussata** LaBerge. Calif. (Blythe, Hopkins Well and Ludlow). Pollen: Unknown, but visits flowers of *Geraea canescens* and *Hoffmanseggia* in the fall.

*Melissodes* (*Eumelissodes*) *cerussata* LaBerge, 1961. Kans. Univ. Sci. Bul. 42: 436. ♀.

Taxonomy: LaBerge, 1963. Nebr. Univ. State Mus., Bul. 4: 238-239. ♂.

**confusa** Cresson. Alta., Man. and Sask. south through Calif., Ariz. and N. Mex. to southern Mexico (Veracruz and Oaxaca). Pollen: Probably oligolectic on a wide range of Compositae, visits flowers of *Agoseris glauca*, *Aplopappus*, *Argemone platyceras*, *Aster canescens*, *Bidens triflorus* var. *macrantha*, *Ceanothus*, *Cirsium undulatum*, *Cleome*, *Cosmos parviflorus*, *Erigeron uniflorus*, *Eryngium asperum*, *Gaillardia*, *Geranium atropurpureum*, *Grindelia squarrosa*, *Helenium bigelovii*, *H. hoopesii*, *Heliopsis scabra*, *Lactuca pulchella*, *Lotus*, *Medicago sativa*, *Monarda pectinata*, *Penstemon*, *Petalostemon purpureum*, *Phacelia*, *Polymenantha*, *Ratibida columnaris*, *Rudbeckia hirta*, *R. laciniata*, *Senecio bigelovii*, *S. purchianus*, *Solidago trinervata*, *Teucrium occidentale*, *Verbena stricta*, *Verbesina encelioides*, *Vicia pulchella*.

*Melissodes confusa* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 205. ♀, ♂.

*Melissodes ruidosensis* Cockerell, 1896. Entomologist 29: 305. ♂.

*Melissodes tenuitarsis* Cockerell, 1905. Psyche 12: 99. ♂.

*Melissodes civica* Cockerell, 1910. Ann. and Mag. Nat. Hist. (8) 5: 258. ♀.

*Melissodes atraticornis* Cockerell, 1934. Amer. Mus. Novitates 697: 9. ♂.

**coreopsis** Robertson. Alta. east to Minn., south to Ill., Tex. and Ariz. Pollen: Oligolectic, principally *Helianthus* and related genera, but visits a wide variety of flowers for pollen and or nectar including *Amphiachyris dracunculoides*, *Amorpha canescens*, *A. fruticosa*, *Aster ericoides villosus*, *A. multiflora*, *A. novaeangliae*, *A. paniculatus*, *A. praetius*, *Bidens involucreta*, *Boltonia asteroides*, *Chrysopsis angustifolia*, *Chrysanthamnus graveolus*, *Cirsium*, *Clematis*, *Cleome serrulata*, *Cooperia pedunculata*, *Convolvulus*, *Coreopsis grandiflorum*, *C. palmata*, *C. tinctoria*, *Cosmos*, *Echinacea angustifolia*, *E. pallida*, *E. purpurea*, *Erucastrum pollichii*, *Eryngium leavenworthii*, *Eupatorium altissimum*, *Euphorbia*, *Eustoma russellianum*, *Gaillardia pulchella*, *Geranium*, *Gossypium herbaceum*, *Grindelia squarrosa*, *Gutierrezia sarothrae*, *Haplopappus*, *Helenium autumnale*, *H. laciniatum*, *H. latifolia*, *H. nudiflorum*, *H. tenuifolium*, *Heterotheca subaxillaris*, *Helianthus annuus*, *H. grosse-serratus*, *H. maximillianus*, *H. petiolaris*, *H. salicifolius*, *H. tuberosus*, *Heliopsis helianthoides*, *Marrubium vulgare*, *Medicago sativa*, *Melilotus alba*, *M. officinalis*, *Monarda citriodora*, *M. pectinata*, *M. punctata*, *Nepeta cataria*, *Opuntia lindheimeri*, *O. macrorhiza*, *Parosela*, *Petalostemon candidum*, *P. oligophyllum*, *P. purpureum*, *Prionopsis ciliata*, *Psoralea floribunda*, *Ratibida columnaris*, *R. pinnata*, *Rudbeckia amplexicaulis*, *R. bicolor*, *R. hirta*, *R. laciniata*, *R. triloba*, *Salsola pestifer*, *Silphium perfoliatum*, *S. speciosum*, *Solidago canadensis*, *S. rigida*, *S. serotina*, *Tetragonotheca ludoviciana*, *Tetraneuris linearifolia*, *Trifolium repens*, *Verbena officinalis*, *V. stricta*, *Verbesina encelioides*, *Vernonia*.

*Melissodes coreopsis* Robertson, 1905. Amer. Ent. Soc., Trans. 31: 368. ♀.

*Melissodes agilis semigilis* Cockerell, 1906. Ann. and Mag. Nat. Hist. (7) 17: 364. ♂.

*Melissodes confusiformis* Cockerell, 1906. Ann. and Mag. Nat. Hist. (7) 17: 366. ♀.

*Melissodes helianthophila* Cockerell, 1914. Ann. and Mag. Nat. Hist. (8) 14: 361. ♂.

**denticulata** Smith. Que. west to N. Dak., south to Fla. and Tex. Pollen: Apparently an oligolectic of *Vernonia* including *V. altissima*, *V. baldwini*, *V. b. interior*, *V. fasciculata*, *V. glauca*, *V. noveboracensis*, *V. texana*, but visits other flowers for nectar including *Amphiachyris dracunculoides*, *Carduus crispus*, *Convolvulus sepium*, *Eupatorium purpurea*, *Ipomoea pandurata*, *Pycnanthemum*, *Silphium laciniatum*, *Solidago juncea*, *Symphoricarpos*, *Verbena hastata*, *V. stricta*.

*Melissodes denticulata* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 311. ♂.

*Melissodes senilis* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 311. ♀.

*Melissodes perplexa* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 206. ♀, ♂.

*Melissodes vernoniana* Robertson, 1905. Amer. Ent. Soc., Trans. 31: 368. ♀, ♂.

**dentiventris** Smith. Southeastern Canada, Mass. west to Kans., south to Ga. and Tex. Pollen: Oligolectic, principally *Aster* including *A. anomalus*, *A. dumosus*, *A. ericoides*, *A. e. villosus*, *A. novaeangliae*, *A. paniculatus*, *A. sagitifolius*, *A. turbinellus*, but visits flowers of other Compositae as well as other families including *Bidens aristosa*, *B. polyplepis*, *Boltonia asteroides*, *Coreopsis tripteris*, *Chrysopsis mariana*, *C. microcephala*, *Eupatorium perfoliatum*, *E. serotinum*, *Helianthus annuus*, *H. divaricatus*, *H. grosse-serratus*, *H. radula*, *Isopappus divaricatus*, *Lespedeza virginica*,

- Lippia lanceolata*, *Polygonum pennsylvanicum*, *Solidago canadensis*, *S. rigida*, *S. ulmifolia*, *Verbena hastata*, *Vernonia*, *Veronica*.
- Melissodes dentiventris* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 312. ♂.
- Melissodes autumnalis* Robertson, 1905. Amer. Ent. Soc., Trans. 31: 369. ♀, ♂.
- Melissodes megacerata* Cockerell, 1906. Ann. and Mag. Nat. Hist. (7) 17: 362. ♂.
- elegans** LaBerge. Tex., Kans. Pollen: Probably an oligolege of Compositae, visits flowers of *Aplopappus divaricatus*, *Aster*, *Boltonia asteroides*, *Cleome*, *Croton monanthrogynus*, *Eupatorium serotinum*, *Fagopyrum*, *Grindelia*, *Helenium tenuifolium*, *Heterotheca latifolia*, *H. subaxillaris*, *Polygonum*, *Prionopsis ciliata*, *Solidago serotina*, *Verbesina encelioides*.
- Melissodes (Eumelissodes) elegans* LaBerge, 1961. Kans. Univ. Sci. Bul. 42: 490. ♀, ♂.
- exilis** LaBerge. Ariz. (Tucson). Pollen: Unknown, but visits flowers of *Aster*, *Viguiera*.
- Melissodes (Eumelissodes) exilis* LaBerge, 1961. Kans. Univ. Sci. Bul. 42: 648. ♀, ♂.
- expolita** LaBerge. Ariz., south. Calif.; Mexico (Sonora). Pollen: Unknown, but visits flowers of *Baileya*, *Chrysanthamnus*, *Encelia farinosa*, *Sphaeralcea emoryi*.
- Melissodes (Eumelissodes) expolita* LaBerge, 1961. Kans. Univ. Sci. Bul. 42: 505. ♀, ♂.
- fasciatella** LaBerge. Ariz. Pollen: Presumably an oligolege of fall flowering Compositae, visits flowers of *Chrysanthamnus*, *Erigeron*, *Gutierrezia*, *Haplopappus gracilis*, *Heterotheca subaxillaris*, *Viguiera*.
- Melissodes (Eumelissodes) fasciatella* LaBerge, 1961. Kans. Univ. Sci. Bul. 42: 445. ♀.
- fumosa** LaBerge. Md. to Nebr. south to S. C., Ala., Miss. Pollen: Presumably an oligolege of Compositae and seems to prefer flowers of the genus *Solidago* including *S. canadensis*, *S. glaberrima*, *S. rupestris*, *S. serotina*, but also visits flowers of *Asclepias tuberosa*, *Aster dumosus*, *Boltonia asteroides*, *Chrysopsis microcephala*, *Eupatorium linearifolium*, *Grindelia*, *Helenium*, *Koellia*.
- Melissodes (Eumelissodes) fumosa* LaBerge, 1961. Kans. Univ. Sci. Bul. 42: 486, figs. 90-91. ♀, ♂.
- gelida** LaBerge. Mont. and N. Dak. south to N. Mex. and Tex. Pollen: Oligolege of Compositae with some preference for flowers of the genus *Helianthus* including *H. annuus*, *H. petiolaris*, but also visits flowers of *Argemone*, *Chrysopsis*, *Cosmos*, *Echinacea*, *Engelmannia pinnatifida*, *Gaillardia*, *Lacinaria squarrosa*, *Monarda pectinata*, *Ratibida columnaris*, *Sphaeralcea*, *Thelesperma gracile*, *Verbena stricta*, *Vernonia*.
- Melissodes (Eumelissodes) gelida* LaBerge, 1961. Kans. Univ. Sci. Bul. 42: 575. ♀, ♂.
- grindeliae** Cockerell. Minn. to Wash., south to southern Calif., Ariz., N. Mex. Pollen: Oligolege of Compositae, visits flowers of *Aster commutatus*, *Chrysopsis hispida*, *Chrysanthamnus nauseosus*, *Cleome serrulata*, *Croton*, *Grindelia squarrosa*, *Haplopappus*, *Helianthus*, *Hymenoxys floribunda*, *H. richardsonii*, *Liatris punctata*, *Lupinus*, *Melilotus alba*, *M. officinalis*, *Petalostemon occidentale*, *Phacelia glandulosa*, *Polymenanthus*, *Psilostrophe gnaphaloides*, *Ratibida columnaris*, *R. tagetes*, *Rudbeckia laciniata*, *Verbena stricta*.
- Melissodes grindeliae* Cockerell, 1898. Denison Univ. Sci. Labs., Bul. 11: 66. ♂, ♀.
- humilior** Cockerell. Ariz., N. Mex., west Tex.; Mexico (Chihuahua). Pollen: Presumably an oligolege of Compositae, visits flowers of *Aster crassulus*, *A. spinosus*, *A. tanacetifolius*, *Grindelia*, *Haplopappus acradenioides*, *Helenium autumnale*, *Heterotheca*, *Lygodesmia juncea*, *Solidago occidentalis*, *Sphaeralcea emoryi*, *Verbesina encelioides*.
- Melissodes humilior* Cockerell, 1903. Ann. and Mag. Nat. Hist. (7) 12: 447, 450. ♀.
- Melissodes intermediella* Cockerell, 1905. South. Calif. Acad. Sci., Bul. 4: 102. ♀.
- hurdi** LaBerge. Calif. (Central Valley). Pollen: Presumably an oligolege of late summer and fall flowering Compositae including *Artemisia*, *Centromadia pungens*, *Grindelia camporum*, *Gutierrezia californica*, *Hemizonia pungens*, *Heterotheca grandiflora*, *Lessingia glandulifera*, *Solidago*.
- Melissodes (Eumelissodes) hurdi* LaBerge, 1961. Kans. Univ. Sci. Bul. 42: 526. ♀, ♂.
- hymenoxidis** Cockerell. Colo., Wyo., Utah, Mont., Calif. Pollen: Presumably an oligolege of late summer and fall flowering Compositae including *Aster foliaceus*, *Chrysopsis*, *Grindelia*, *Haplopappus suffruticosus*, *Hymenoxys lingulaefolia*, but also visits *Lupinus* and an unspecified mint.
- Melissodes hymenoxidis* Cockerell, 1906. Amer. Mus. Nat. Hist., Bul. 22: 443. ♀.

Taxonomy: Lanham, 1977. Kans. Ent. Soc., Jour. 50: 312 (holotype).

*Melissodes fremontii* Cockerell, 1907. Entomologist 40: 268. ♂.

*Melissodes kelloggi* Cockerell, 1919. Ent. News 30: 293. ♂.

**illata** Lovell and Cockerell, P. E. I. to Alta., south to N. C. in the mts. and Ill. Pollen: Oligolege of Compositae, especially *Solidago* and *Aster*, visits flowers of *Aster azureus*, *Cirsium arvense*, *Chrysanthemum leucanthemum* pinnatifidum, *Grindelia*, *Helianthus stramosus*, *Hieracium aurantiacum*, *Leontodon*, *Rudbeckia serotina*, *Solidago canadensis*, *S. gigantea leiophylla*, *S. juncea*, *Sonchus*, *Tanacetum vulgare*.

*Melissodes illata* Lovell and Cockerell, 1906. Psyche 13: 110. ♀, ♂.

**limbus** LaBerge. Ariz., N. Mex. and Tex., to central Mexico (Jalisco and Hidalgo). Pollen: Oligolege of Compositae, especially *Verbesina*, *Aplopappus* and *Baileya*, visits flowers of *Aplopappus gracilis*, *A. spinulosus*, *A. tenuisectus*, *Argemone*, *Aster*, *Baccharis*, *Baileya multiradiata*, *Chrysothamnus*, *Encelia farinosa*, *Eriogonum*, *Gossypium herbaceum*, *Grindelia*, *Gutierrezia*, *Hymenothrix wislizenii*, *Kallstroemia grandiflora*, *Marrubium vulgare*, *Melilotus alba*, *Pectis papposa*, *Sphaeralcea*, *Verbesina encelioides*, *V. exauriculata*, *Wedelia incarnata*.

*Melissodes (Eumelissodes) limbus* LaBerge, 1961. Kans. Univ. Sci. Bul. 42: 585. ♀, ♂.

**lutulenta** LaBerge. B. C. to Sask., south to Calif. Ariz. and Mexico (Guanajuato). Pollen: Oligolege of Compositae, especially *Chrysothamnus*, *Grindelia* and *Solidago*, visits *Achillea millefolia*, *Anthemis cotulla*, *Aster spinosus*, *Centromadia pungens*, *Chaemataxis*, *Chrysothamnus*, *Cleome*, *Grindelia squarrosa*, *Gutierrezia*, *Helianthus*, *Melilotus alba*, *Mentzelia veatchiana*, *Solidago occidentalis*.

*Melissodes (Eumelissodes) lutulenta* LaBerge, 1961. Kans. Univ. Sci. Bul. 42: 599. ♀, ♂.

**manipularis** Smith. Fla. to N. C., ?Va. Pollen: Unknown, but visits flowers of *Chrysopsis*, *Kuhnistera*, *Petalostemon*. The Virginia record pertains to a collection made at the flowers of *Eupatorium* in Falls Church and has not been verified since it was published in 1907 by Cockerell.

*Melissodes manipularis* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 312. ♂.

Taxonomy: Cockerell, 1905. Amer. Ent. Soc., Trans. 31: 329.

**melanura** (Cockerell). Calif., Nev. Pollen: Presumably an oligolege of summer and fall flowering Compositae including *Aster*, *Corethrogyne bernardina*, *Erigeron*, *Gutierrezia californica*, *G. sarothrae*, *Haplopappus linearifolius*, *Lessingia glandulifera*, *Solidago elongata*, but also visits flowers of *Eriogonum virgatum*.

*Exomalopsis melanurus* Cockerell, 1916. Pomona Jour. Ent. Zool. 8: 59. ♀.

**menuachus** Cresson. B. C., Alta. and N. Dak., south to Calif., Tex., and Ill.; Mexico (Chihuahua, Zacatecas). Parasite: *Triepeolus occidentalis* Cress.? Pollen: Oligolege of Compositae, especially *Grindelia* and *Solidago*, visits flowers of *Argemone intermedia*, *A. platyceras*, *Aster laevis*, *A. multiflora*, *Cassia chamaecrista*, *Chrysopsis*, *Chrysothamnus graveolus glabrata*, *Cleome serrulata*, *Eustoma russellianum*, *Gaillardia*, *Grindelia inornata*, *G. squarrosa*, *Gutierrezia californicum*, *G. sarothrae*, *Helianthus annuus*, *H. petiolaris*, *Hymenothrix wislizenia*, *Medicago sativa*, *Melilotus alba*, *Petalostemon oligocephalum*, *Polygonum*, *Rudbeckia laciniata*, *Sidalcea neomexicana*, *Solidago canadensis*, *S. rigida*, *Verbena*, *Viguiera*, *Xanthocephalum gymnospermoides*.

*Melissodes Menuachus* Cresson, 1868. Amer. Ent. Soc., Trans. 1: 388. ♂.

*Melissodes mennacus*(?) Uhler, 1877. U. S. Geol. Geog. Survey, Bul. 3: 783.

*Melissodes pallida* Robertson, 1895. Amer. Ent. Soc., Trans. 22: 127. ♀.

*Melissodes Mizeae* Cockerell, 1905. Ann. and Mag. Nat. Hist. (7) 15: 522. ♀.

*Melissodes blakei* Cockerell, 1905. Ann. and Mag. Nat. Hist. (7) 15: 523. ♀.

*Melissodes lavata* Cockerell, 1924. Pan-Pacific Ent. 1: 56. ♀.

*Melissodes octobris* Cockerell, 1934. Ent. News 45: 30. ♀.

Biology: Hicks, 1926. Colo. Univ., Studies 15: 225 (nest site).

**micheneri** LaBerge. Calif. (Sierra Nevada Mts. and Peninsular Mts. of south. Calif.). Pollen: Oligolege of Compositae, especially *Chrysothamnus* and *Chrysopsis*, visits flowers of *Bigelovia*, *Chrysopsis fastigiata*, *C. villosa*, *Chrysothamnus nauseosus*, *Haplopappus arborescens*, *H. bloomeri angustatus*, *Solidago*.

*Melissodes (Eumelissodes) micheneri* LaBerge, 1961. Kans. Univ. Sci. Bul. 42: 642. ♀, ♂.



**microsticta** Cockerell. B. C. to Sask. south to southern Calif., Nev., Utah., Colo., and Tex.

Pollen: Oligolege of Compositae, visits flowers of *Artemisia*, *Aster adscendens*, *A. canescens*, *A. delectabilis*, *A. foliaceus*, *Calyptidium umbellatum*, *Carduus*, *Cichorium intybus*, *Chrysopsis fastigiata*, *C. villosus*, *Chrysothamnus nauseosus*, *C. n. consimilis*, *Corethrogyne*, *Cryptantha intermedia*, *Erigeron stenophyllus*, *Eriogonum subscaposum*, *Grindelia squarrosa*, *Gutierrezia californica*, *G. sarothrae*, *Haplopappus*, *Helenium bigelovii*, *Helianthus*, *Hemizonia wheeleri*, *H. wrightii*, *Malvastrum paniculata*, *Penstemon*, *Phacelia humilis*, *Senecio ionophyllus*, *Solidago elongata*, *S. occidentalis*, *Sphaeralcea fasciculata*.

*Melissodes microsticta* Cockerell, 1905. In Viereck, Canad. Ent. 37: 321. ♂.

**monoensis** LaBerge. Calif. (Mono Co.). Pollen: Unknown, but visits flowers of *Chrysothamnus*.

*Melissodes (Eumelissodes) monoensis* LaBerge, 1961. Kans. Univ. Sci. Bul. 42: 623. ♀, ♂.

**montana** Cresson. Colo. and Utah, south through Tex., N. Mex., and Ariz. to south. Mexico (Oaxaca). Pollen: Oligolege of Compositae, visits flowers of *Aplopappus gracilis*, *Asclepias*, *Aster commutatus*, *Croton*, *Erigeron*, *Eriogonum*, *Grindelia*, *Gutierrezia*, *Helianthus annuus*, *Heterotheca psammophila*, *H. subaxillaris*, *Polymentha*, *Senecio longilobus*, *Verbesina exauriculata*, but also is known to collect pollen from flowers of *Kallstroemia grandiflora*.

*Melissodes montana* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 202. ♀, ♂.

*Melissodes hirsuta* Smith, 1879. Descr. n. spp. Hym. Brit. Mus., p. 116. ♂.

*Eucera oajacana* Dalla Torre, 1896. Cat. Hym. v. 10, p. 242. N. name for *hirsuta* Smith, a secondary homonym in *Eucera*.

*Melissodes atrifera* Cockerell, 1910. Ann. and Mag. Nat. Hist. (8) 5: 256. ♂.

*Melissodes atrifera sandiarum* Cockerell, 1910. Ann. and Mag. Nat. Hist. (8) 5: 257. ♂.

Biology: Cazier and Linsley, 1974. Amer. Mus. Novitates 2546: 14 (floral relationships).

**moorei** Cockerell. Calif. Pollen: Oligolege of Compositae, visits flowers of *Corethrogyne*, *Erigeron glaucus*, *Grindelia platyphylla*, *Hemizonia paniculata*, *Heterotheca grandiflora*, *Solidago*.

*Melissodes moorei* Cockerell, 1926. Ann. and Mag. Nat. Hist. (9) 18: 624. ♀.

**nivea** Robertson. N. Y. to Minn. and Kans., south to N. C., Ala., and Miss. Pollen: Oligolege of Compositae, especially *Solidago*, *Aster* and *Liatris*, visits flowers of *Aster ericoides*, *A. sagittifolius*, *Bidens laevis*, *Boltonia asterioides*, *Chrysopsis mariana*, *Gerardia*, *Helenium*, *Helianthus annuus*, *H. atrorubens*, *Lacinaria*, *Lepachys pinnata*, *Liatris graminifolia*, *Prionopsis ciliata*, *Solidago canadensis*, *S. lanceolata*, *S. rigida*, *S. serotina*, *Vernonia glauca*.

*Melissodes nivea* Robertson, 1895. Amer. Ent. Soc., Trans. 22: 127. ♀.

**ochraea** LaBerge. South. Calif., Ariz. Pollen: Presumably an oligolege of Compositae, visits flowers of *Baccharis*, *Chrysothamnus*, *Gutierrezia*, *Haplopappus acradenius*.

*Melissodes (Eumelissodes) ochraea* LaBerge, 1961. Kans. Univ. Sci. Bul. 42: 428. ♀, ♂.

**pallidisignata** Cockerell. B. C. to Man., south through south. Calif. and N. Mex. to central Mexico (Aguascalientes). Pollen: Oligolege of Compositae especially *Haplopappus*, *Chrysothamnus*, *Lajia*, *Erigeron* and *Grindelia*, visits flowers of *Aplopappus gracilis*, *Aster adscendens delectabilis*, *Centromadia pungens*, *Chrysopsis hispida*, *Chrysothamnus nauseosus*, *C. n. mojaviensis*, *C. n. occidentalis*, *C. viscidiflorus typicus*, *Cirsium*, *Cleome serrulata*, *Ericameria palmeri*, *Grindelia camporum*, *G. latifolia*, *G. platyphylla*, *G. squarrosa*, *Gutierrezia californica*, *G. sarothrae*, *Haplopappus acradenius*, *H. vernonioides*, *Helianthus*, *Heliotropium*, *Hemizonia pungens*, *Heterotheca grandiflora*, *Lepachys*, *Lessingia glandulifera*, *Medicago sativa*, *Melilotus alba*, *Petalostemon occidentalis*, *Pluchea persica*, *Psilostrophe gnaphalodes*, *Senecio ionophyllus*, *Solidago canadensis*, *S. confinis*, *S. occidentalis*, *Wislizenia refracta*.

*Melissodes nigrosignata pallidisignata* Cockerell, 1905. Biol. Soc. Wash., Proc. 18: 180. ♀.

*Melissodes menuacha vernoniensis* Viereck, 1905. Canad. Ent. 37: 320. ♀, ♂.

*Melissodes praelauta* Cockerell, 1905. Psyche 12: 102. ♂.

Biology: Thorp and Chemsak, 1964. Pan-Pacific Ent. 40: 75-83, 2 figs. (life history).

- paucipuncta** LaBerge. Ariz. Pollen: Possibly oligolectic on *Opuntia*, a male has been taken at flowers of *Bebbia*.  
*Melissodes (Eumelissodes) paucipuncta* LaBerge, 1961. Kans. Univ. Sci. Bul. 42: 650. ♀, ♂.
- paulula** LaBerge. Wash. to southern Calif. Pollen: Oligolectic of Compositae, especially *Haplopappus*, *Gutierrezia*, and *Solidago*, visits flowers of *Baccharis emoryi*, *Croton californicus*, *Ericameria palmeri*, *Erigeron canadensis*, *Eriogonum fasciculatum*, *E. gracile*, *Gutierrezia californica*, *G. sarothrae*, *Haplopappus acradenius*, *H. arborescens*, *H. vernonioides*, *Pluchea camphorata*, *Salsola kali*, *Senecio douglasii*, *Solidago californica*, *S. elongata*, *S. occidentalis*.  
*Melissodes (Eumelissodes) paulula* LaBerge, 1961. Kans. Univ. Sci. Bul. 42: 631. ♀, ♂.
- perlusa** Cockerell. Alta. and Man., south to Iowa and Ariz. Pollen: Possibly an oligolectic of *Helianthus* including *H. annuus*, *H. petiolaris*, but also visits flowers of *Bigelovia*, *Brauneria pallida*, *Grindelia*, *Medicago sativa*, *Mentha canadensis*, *Petalostemon oligophyllum*, *Ratibida columnaris*.  
*Melissodes semiagitilis perlusa* Cockerell, 1925. Ann. and Mag. Nat. Hist. (9) 16: 231. ♂.
- Taxonomy: Cockerell, 1914. Canad. Ent. 46: 413. ♀.
- perpolita** LaBerge. Ariz., N. Mex., Colo., (?) Utah. Pollen: Unknown, but visits flowers of *Aster*, *Chaenactis*, *Grindelia*, *Haplopappus spinulosus*.  
*Melissodes (Eumelissodes) perpolita* LaBerge, 1961. Kans. Univ. Sci. Bul. 42: 443. ♀, ♂.
- personatella** Cockerell. Central and southern Calif.; Guatemala (Jicaro). Pollen: Unknown, but visits flowers of *Eriogonum gracile*, *E. subscaposum*, *Gutierrezia californica*, *G. sarothrae*, *Hagardia squamosa*, *Haplopappus palmeri*, *H. vernonioides*, *Hemizonia paniculata*, *Heterotheca grandiflora*, *Palafoxia linearis*.  
*Melissodes personatella* Cockerell, 1901. Canad. Ent. 33: 297. ♂.
- pexa** LaBerge. Ariz.; Mexico (Coahuila, Chihuahua). Pollen: Unknown, but visits flowers of *Lepidium alyssoides*.  
*Melissodes (Eumelissodes) pexa* LaBerge, 1961. Kans. Univ. Sci. Bul. 42: 621. ♀, ♂.
- pilleata** LaBerge. N. C. Pollen: Possibly an oligolectic of Compositae, visits flowers of *Aster*, *Chrysopsis*, *Gerardia flava*, *Haplopappus*, *Kuhnistera pinnata*, *Liatris*.  
*Melissodes (Eumelissodes) pilleata* LaBerge, 1961. Kans. Univ. Sci. Bul. 42: 459. ♀, ♂.
- pullatella** LaBerge. Oreg. Pollen: Unknown, but visits flowers of *Grindelia*.  
*Melissodes (Eumelissodes) pullatella* LaBerge, 1961. Kans. Univ. Sci. Bul. 42: 620. ♀.
- relucens** LaBerge. N. Mex. (Mesilla Park), Tex. (El Paso and Big Bend Natl. Pk.). Pollen: Unknown, but visits flowers of *Chrysopsis hirsutissima*, *Haplopappus heterophylla*.  
*Melissodes (Eumelissodes) relucens* LaBerge, 1961. Kans. Univ. Sci. Bul. 42: 437. ♀, ♂.
- robustior** Cockerell. Wash., Oreg., Idaho, Nev., Calif. Parasite: *Nemognatha hurdi* MacSwain, *Sphaerophthalma unicolor* (Cress.). Pollen: Oligolectic of Compositae, especially *Helianthus* including *H. annuus*, *H. bolanderi*, *H. gracilentus*, *H. lenticularis*, *H. petiolaris*, but also visits flowers of *Asclepias*, *Aster*, *Brassica adpressa*, *B. geniculata*, *B. incana*, *Chaenactis artemisifoliae*, *C. glabriuscula*, *Chrysothamnus*, *Cichorium*, *Cirsium lanceolatum*, *Coreopsis grandiflora*, *C. lanceolata*, *C. tinctoria*, *Corethrogyne bernardina*, *Cosmos*, *Encelia californica*, *E. farinosa*, *Gaillardia*, *Godetia bottae*, *Grindelia camporum*, *G. elata*, *Gutierrezia californica*, *G. sarothrae*, *Haplopappus vernonioides*, *Hemizonia paniculata*, *H. pungens*, *H. wrightii*, *Heterotheca grandiflora*, *Lactuca serriola*, *Lythrum californicum*, *Marrubium vulgare*, *Scabiosa atropurpurea*, *Senecio douglasii*, *Solidago californica*, *S. confinis*, *Stephanomeria exigua*.  
*Melissodes robustior* Cockerell, 1915. Ann. and Mag. Nat. Hist. (8) 16: 482. ♀, ♂.
- Biology: MacSwain, 1958. Pan-Pacific Ent. 34: 40. — Chemsak and Thorp, 1962. Pan-Pacific Ent. 38: 53-55 (nest).
- rustica** (Say). N. S. to Sask., south to Ga., La., N. Mex. and southern Mexico (Oaxaca), but not known in Tex. and Okla. Parasite: *Tripeolus eldredi* Ckll., *T. pectoralis* (Robt.). Pollen: Oligolectic of Compositae, especially *Solidago*, *Aster*, *Grindelia*, *Aplopappus*, analyzed cell provisions of nests in Wyo. showed that females obtained pollen exclusively from *Eriophyllum integrifolium*; visits flowers of *Abutilon theophrasti*, *Amphichyris dracunculoides*, *Aplopappus gracilis*, *Asclepias*, *Aster anomalus*, *A. commutatus*, *A.*

*crenulis*, *A. dumosus*, *A. ericoides*, *A. e. villosus*, *A. exiguus*, *A. grandiflorus*, *A. laevis*, *A. lateriflorus*, *A. multiflorus*, *A. novaeangliae*, *A. paniculatus*, *A. praestus*, *A. sagittifolius*, *A. salicifolius*, *A. turbinellus*, *Baccharis*, *Bidens aristosa*, *B. laevis*, *B. asteroides*, *Centaurea junccea*, *Chrysopsis*, *C. mariana*, *Cirsium arvense*, *C. lanceolatum*, *Cleome lutea*, *C. serrulata*, *Coreopsis tripteris*, *Cosmos*, *Epilobium perfoliatum*, *Gaillardia*, *Grindelia squarrosa*, *Helium autumnale*, *H. tenuifolium*, *Helianthus atrorubens*, *H. divaricatus*, *H. grosse-serratus*, *H. maximillianus*, *H. petiolaris*, *H. radula*, *H. tuberosus*, *Heliopsis helianthoides*, *Hieracium scabrum*, *Lycopus americanus*, *Marrubium vulgare*, *Melilotus alba*, *M. officinalis*, *Mentha*, *Physostegia parviflora*, *Polymenantha*, *Ratibida columnaris*, *R. pinnata*, *Rudbeckia laciniata*, *R. submontensis*, *R. triloba*, *Silphium perfoliatum*, *Solidago altissima*, *S. canadensis*, *S. graminifolia*, *S. junccea*, *S. nemoralis*, *S. rigida*, *S. rugosa*, *S. serotina*, *Spiraea alba*, *Verbena hastata*, *V. stricta*, *Verbesina virginica*, *Vernonia fasciculata*, *V. glauca*.

*Macrocera rustica* Say, 1837. Boston Jour. Nat. Hist. 1: 406. ♂, ♀.

*Melissodes assimilis* Smith, 1879. Descr. n. spp. Hym. Brit. Mus., p. 114. ♀.

*Melissodes ambigua* Smith, 1879. Descr. n. spp. Hym. Brit. Mus., p. 116. ♀.

*Melissodes festinata* Provancher, 1888. Addit. Corr. Faune Ent. Canada, Hym. v. 2, p. 300. ♀, ♂.

*Melissodes simillima* Robertson, 1897. Acad. Sci. St.-Louis, Trans. 7: 355. ♀, ♂.

*Melissodes asteris* Robertson, 1914. Ent. News 25: 373. ♀.

Taxonomy: Clement, 1973. Kans. Ent. Soc., Jour. 46: 521, figs. 3-6 (larva).

Biology: Clement, 1973. Kans. Ent. Soc., Jour. 46: 516-525, 6 figs., 1 table (nest architecture, pollen stores, parasite).

**saponellus** Cockerell. Wash., Oreg., Calif., Utah, Colo. Pollen: Unknown, but visits flowers of *Bahia oblongifolia*, *Chaenactis stevioides*, *Encelia actoni*, *Sphaeralcea*, *Trifolium*.

*Melissodes saponellus* Cockerell, 1908. Canad. Ent. 40: 234. ♀.

Biology: LaBerge, 1963. Nebr. Univ. State Mus., Bul. 4: 241 (interspecific copulation).

**semilupina** Cockerell. B. C. south to Calif., east to Colo. and N. Mex. Pollen: Oligolege of Compositae, especially *Chrysothamnus* and *Haplopappus*, visits flowers of *Chrysothamnus nauseosus*, *C. n. consimilis*, *C. viscidiflorus typicus*, *Cleome*, *Gutierrezia californica*, *Haplopappus vernonioides*, *Hemizonia paniculata*, *Solidago occidentalis*.

*Melissodes menuacha semilupina* Cockerell, 1905. South. Calif. Acad. Sci., Bul. 4: 29. ♂.

*Melissodes chrysothamni* Cockerell, 1905. Ann. and Mag. Nat. Hist. (7) 15: 524. ♀.

**snowii** Cresson. Alta., Man., Colo., N. Mex., Nebr., N. Dak. Pollen: Probably an oligolege of Compositae, especially *Helianthus* and *Solidago*, visits flowers of *Aster*, *Cleome serrulata*, *Gaillardia*, *Gutierrezia sarothrae*, *Helianthus petiolaris*, *H. subrhomboides*, *Lacinaria punctata*, *Medicago sativa*, *Solidago missouriensis*, *S. nemoralis*, *S. rigida*.

*Melissodes snowii* Cresson, 1872. Acad. Nat. Sci. Phila., Proc. 24: 211. ♂.

**subagilis** Cockerell. Minn., Alta. and Wash. south to northern Calif., Ariz. and Tex. Pollen:

Oligolege of *Grindelia* including *G. nana*, *G. squarrosa*, but visits other flowers including *Aplopappus gracilis*, *A. spinulosus*, *A. tenuisectus*, *Aster adscendens*, *Baccharis*, *Baileya multiradiata*, *Bigelovia wrightii*, *Chrysopsis hispida*, *Chrysothamnus viscidiflorus*, *Cleome serrulata*, *Erigeron*, *Gossypium herbaceum*, *Gutierrezia sarothrae*, *Haplopappus acradenioides*, *Helianthus annuus*, *H. maximillianus*, *H. petiolaris*, *Heterotheca subaxillaris*, *Medicago sativa*, *Pectis papposa*, *Petalostemon*, *Prionopsis ciliata*, *Ratibida tagetes*, *Salsola pestifer*, *Silphium*, *Solidago rigida*, *S. serotina*, *Sphaeralcea*, *Verbena hastata*, *Verbesina exauriculata*.

*Melissodes agilis* var. *subagilis* Cockerell, 1905. Entomologist 38: 145. ♂.

*Melissodes pecosella* Cockerell, 1905. Biol. Soc. Wash., Proc. 18: 179. ♀.

*Tetraloniella excurrens melanaspis* Cockerell, 1925. Ann. and Mag. Nat. Hist. (9) 16: 228. ♀.

*Xenoglossodes albertensis* Cockerell, 1937. Canad. Ent. 69: 87. ♀.

Biology: Hicks, 1926. Colo. Univ., Studies 15: 225 (nest).

**subillata** LaBerge. Que. to Sask., south to N. C. and Ill. Pollen: Oligolege of Compositae, visits flowers of *Aster azureus*, *Chrysanthemum leucanthemum*, *Cichorium intybus*, *Cirsium arvense*, *Coreopsis grandiflora*, *C. lanceolata*, *Echinacea pallida*, *Epilobium angustifolium*, *Eupatorium maculatum*, *Gaillardia aristata*, *Helianthus maximilianus*, *H. petiolaris*, *Hieraceum aurantiacum*, *Latuca pulchella*, *Petalostemon oligophyllum*, *Platycodon grandiflorum*, *Psoralea lanceolata*, *Ratibida columnaris*, *Rudbeckia hirta*, *R. laciniata*, *Solidago graminifolium*, *Sonchus arvensis glabrescens*, *Teucrium occidentale*, *Vernonia fasciculata*.

*Melissodes (Eumelissodes) subillata* LaBerge, 1961. Kans. Univ. Sci. Bul. 42: 568, figs. 99-101. ♀, ♂.

**submenuacha** Cockerell. Colo., Ariz., N. Mex., western Tex. Pollen: Probably an oligolege of Compositae, visits flowers of *Aplopappus gracilis*, *Bidens*, *Cleome serrulata*, *Haplopappus heterophylla*, *Helianthus annuus*, *H. petiolaris*, *Hymenothrix wislizeni*, *Medicago sativa*, *Verbesina encelioides*, *V. oreophila*.

*Melissodes menuacha* var. *submenuacha* Cockerell, 1897. Entomologist 30: 137. ♂.

*Melissodes Hewetti* Cockerell, 1905. Ann. and Mag. Nat. Hist. (7) 15: 527. ♀.

Taxonomy: LaBerge, 1963. Nebr. Univ. State Mus., Bul. 4: 241-242 (geogr. and floral records).

**tincta** LaBerge. Minn. and Mich. south to Tex. and Fla. Pollen: Oligolege of Compositae, seems to prefer *Chrysopsis* and *Aster*, visits flowers of *Aster longicaulus*, *Chrysopsis microcephala*, *Helianthus maximilianus*, *Verbesina encelioides*.

*Melissodes (Eumelissodes) tincta* LaBerge, 1961. Kans. Univ. Sci. Bul. 42: 493. ♀, ♂.

**trinodis** Robertson. Southeast. Canada, Kans. and N. Dak. east to Maine and Ga. Parasite: *Tripeolus helianthi* (Robt.). Pollen: Oligolege of Compositae, especially *Helianthus* including *H. annuus*, *H. a. coronarius*, *H. atrorubens*, *H. divaricatus*, *H. grosse-serratus*, *H. maximilianus*, *H. mollis*, *H. salicifolius*, *H. tuberosus*, but also visits flowers of *Arctium*, *Asclepias incarnata*, *Aster anomalus*, *A. praeratus*, *Bidens aristosa*, *B. laevis*, *Blephilia hirsuta*, *Carduus crispus*, *Cassia chamaecrista*, *Cirsium lanceolata*, *Coreopsis palmata*, *C. tripteris*, *Dichophyllum marginatum*, *Grindelia*, *Helenium altissimum*, *H. autumnale*, *Heliopsis helianthoides*, *Lepachys pinnata*, *Liatris*, *Monarda fistulosa*, *Pepo*, *Petalostemon purpureum*, *Ratibida columnaris*, *Rudbeckia hirta*, *R. laciniata*, *R. submentosa*, *R. triloba*, *Solidago canadensis*, *S. rupestris*, *S. ulmifolia*, *Symphoricarpos*, *Teucrium canadense*, *Verbena hastata*, *V. stricta*, *Vernonia glauca*, *V. baldwini interior*, *Veronica*.

*Melissodes trinodis* Robertson, 1901. Canad. Ent. 33: 231. ♀, ♂.

Biology: Graenicher, 1905. Wis. Nat. Hist. Soc., Bul. 3: 164 (nest).

**tristis** Cockerell. Nebr. to Calif., south through Tex. and Ariz. to southern Mexico (Puebla).

Pollen: Most polylectic of all the species of the subgenus *Eumelissodes*, seems to prefer flowers of the Leguminosae, Compositae and Malvaceae, visits flowers of *Acacia*, *Actinaea acutis*, *A. richardsonii*, *Allionia incarnata*, *Arabis*, *Argemone*, *Asclepias galloides*, *A. verticillata*, *Aster canescens*, *A. spinosa*, *A. tanacetifolium*, *Astragalus*, *Baccharis*, *Bakia*, *Baileya multiradiata*, *Berberis trifoliata*, *B. wilcoxii*, *Canotia holocantha*, *Ceanothus fendleri*, *C. greggii*, *Celtis pallida*, *Cercidium texanum*, *Cevalia sinuata*, *Chilopsis linearis*, *C. saligna*, *Chrysopsis hispida*, *Chrysanthamnus*, *Cirsium ochrocentrum*, *C. undulatum*, *Cleome luteum*, *C. serrulata*, *Convolvulus*, *Croton luteovirens*, *Dalea lasianthera*, *Dasyllirion wheeleri*, *Encelia*, *Engelmannia pinnatifida*, *Erigeron canadensis*, *Eriogonum trichopes*, *Euphorbia albomarginata*, *Eysenhardtia polystacha*, *E. spinosa*, *Gaillardia pinnatifida*, *G. pulchella*, *G. suavis*, *Gaura*, *Gilia calcarea*, *Gossypium herbaceum*, *Grindelia*, *Gutierrezia californica*, *Haplopappus gracilis*, *H. laricifolius*, *Helenium autumnale*, *H. hoopesii*, *H. laciniatum*, *Helianthus annuus*, *H. ciliaris*, *H. petiolaris*, *Hoffmanseggia densiflora*, *H. jamesii*, *Hymenothrix wislizenii*, *Iris mios*, *Kallstroemia grandiflora*, *Larrea tridentata*, *Lepidium*, *Lesquerella ovalifolia*, *Lippia cuneifolia*, *L. ligustrina*, *Lotus*, *Lupinus*, *Lygodesmia juncea*, *Malvastrum cockerelli*, *Marrubium vulgare*, *Medicago sativa*, *Melilotus alba*, *M. officinalis*, *Mentzelia multiflora*, *Mertensia franciscana*, *Mimosa borealis*, *Monarda citriodora*, *M. pectinata*, *Mortonia scabrella*, *Nepeta cataria*, *Nolina microcarpa*,

*Opuntia basilaris*, *O. lindheimeri*, *O. macrorhiza*, *Parkinsonia*, *Pectis papposa*, *Penstemon superba*, *Petalostemon candidum*, *P. flavescens*, *P. occidentatum*, *Phacelia glandulosa*, *P. popei*, *Philadelphus microphyllus*, *Polemonium*, *Prionopsis*, *Prosopis juliflora*, *Psoralea tenuiflora*, *Pyracantha*, *Ratibida columnaris*, *R. tagetes*, *Rhus*, *Rosa*, *Salix*, *Salsola kali*, *S. pestifer*, *Salvia lemmoni*, *Sapindus drummondii*, *S. sapinarius*, *Senecio longilobus*, *S. werneriifolius*, *Solanum elaeagnifolium*, *Solidago annua*, *S. stenolobus*, *Sphaeralcea angustifolia*, *S. coccinea*, *S. emoryi*, *S. laxa*, *S. lobata*, *S. marginata*, *Stephanomeria*, *Tamarix gallica*, *Thurberia thespesioides*, *Verbena stricta*, *Verbesina encelioides*, *Vernonia*, *Vicia*, *Wislizenia refracta*, *Zexmenia podocephala*, *Zinnia grandiflora*.

*Melissodes tristis* Cockerell, 1894. Ent. News 5: 234. ♂.

*Melissodes pallidicincta* Cockerell, 1896. Entomologist 29: 306. ♀.

*Melissodes tristis* var. *malvina* Cockerell, 1902. Entomologist 35: 177. ♂.

*Melissodes semitristis* Cockerell, 1905. Psyche 12: 102. ♂.

*Melissodes pallidicincta erythrina* Cockerell, 1925. Ann. and Mag. Nat. Hist. (9) 16: 231. ♂.

Biology: Linsley, 1962. Ent. Soc. Amer., Ann. 55: 161, fig. 8 (sleep). —Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 41-42, fig. 17 (intrafloral relationships with *Larrea*).

**utahensis** LaBerge. Utah and Nev., south to south. Calif. and Ariz., Nebr. Pollen: Unknown, but visits flowers of *Chrysothamnus* including *C. nauseosus*, *Chaemataxis*, *Eriogonum heermannii*, *Gutierrezia californica*.

*Melissodes* (*Eumelissodes*) *utahensis* LaBerge, 1961. Kans. Univ. Sci. Bul. 42: 602, figs. 109-110. ♀, ♂.

**velutina** (Cockerell). South. and cent. Calif. Pollen: Polylege, especially of Polemoniaceae and Compositae, visits flowers of *Acanthopappus sphaerocephalus*, *Aster abatus*, *Chorizanthe staticoides*, *Cirsium*, *Coreopsis lanceolata*, *Cryptantha internedia*, *Encelia actoni*, *Eremocarpus setigerus*, *Eriogonum fasciculatum*, *Gutierrezia californica*, *G. sarothrae*, *G. stricta*, *Helianthus gracilentus*, *Heliotropium curassavicum* var. *oculatum*, *Hugelia ambigua*, *H. virgata*, *Lotus scoparius*, *Marrubium vulgare*, *Mirabilis laevis*, *Monarda lanceolata*, *Prosopis*, *Salvia columbariae*, *Trichostema lanatum*.

*Ezomalopsis velutinus* Cockerell, 1916. Pomona Jour. Ent. Zool. 8: 58. ♀.

**verbesinarum** Cockerell. Wash. to southern Calif., east to Nev. and Tex.; Mexico (Chihuahua to Jalisco). Pollen: Oligolege of Compositae, visits flowers of Actinea, *Argemone platyceras*, *Aster canescens*, *A. tanacetifolius*, *Baileya multiradiata*, *Bigelovia*, *Cevallia sinuata*, *Chaenactis*, *Chrysothamnus*, *Croton californicus*, *Encelia californica*, *Erigeron*, *Eysenhardtia polystachya*, *Geraea canescens*, *Grindelia*, *Gutierrezia lucida*, *Haplopappus acradenius*, *Lygodesmia juncea*, *Pectis papposa*, *Psilostrophe cooperi*, *Sphaeralcea*, *Tamarix*, *Verbesina encelioides*.

*Melissodes pecosella verbesinarum* Cockerell, 1905. Biol. Soc. Wash., Proc. 18: 180. ♀.

**vernalis** LaBerge. Wash. and Nev. to southern Calif. and Ariz.; Mexico (Baja California, Sonora, and Hidalgo). Pollen: Oligolege of Compositae, especially *Encelia* and *Geraea*, visits flowers of *Aster abatus*, *A. agnatus*, *Baileya multiradiata*, *Bebbia juncea*, *Chilopsis linearis*, *Encelia farinosa*, *Geraea canescens*, *Hyptis emoryi*, *Melilotus*, *Prosopis*, *Psilostrophe cooperi*, *Sphaeralcea ambigua*, *Viguiera deltoidea*.

*Melissodes* (*Eumelissodes*) *vernalis* LaBerge, 1961. Kans. Univ. Sci. Bul. 42: 608, figs. 113-114. ♀, ♂.

**vernoniae** Robertson. Ind., and N. Dak., west to Idaho, south to N. Mex. and Tex. Pollen: Polylectic, collects pollen of *Vernonia*, also probably uses pollen from *Helianthus* and possibly *Ipomoea*, visits flowers of *Bidens*, *Gaillardia pulchella*, *Grindelia*, *Helianthus tuberosus*, *Helioopsis helianthoides*, *Ipomoea pandurata*, *Lacinaria*, *Lactuca pulchella*, *Liatris*, *Monarda fistulosa*, *Polygonum*, *Rudbeckia hirta*, *Silphium laciniatum*, *S. speciosum*, *Verbena stricta*, *Vernonia altissima*, *V. fasciculata*, *V. baldwini interior*, *V. longifolia*, *V. texana*.

*Melissodes vernoniae* Robertson, 1902. Canad. Ent. 34: 323. ♀, ♂.

*Melissodes confusiformis incondita* Cockerell, 1925. Ann. and Mag. Nat. Hist. (9) 16: 230. ♀.

**wheeleri** Cockerell. Mich. and N. Dak., south to La., Tex. and Ariz. Pollen: Oligolege of Compositae, especially *Gaillardia*, *Helianthus* and *Rudbeckia*, visits flowers of *Anthemis cotula*, *Asclepias tuberosa*, *Cleome serrulata*, *Coreopsis*, *Echinacea*, *Engelmannia bipinnatifida*, *Gaillardia pulchella*, *Grindelia squarrosa*, *Helianthus annuus*, *H. debilis*, *H. petiolaris*, *Opuntia*, *Petalostemon purpureum*, *Ratibida columnaris*, *Rudbeckia bicolor*, *R. grandiflora*, *R. hirta*, *Silphium asperinum*, *Sphaeralcea*.

*Melissodes wheeleri* Cockerell, 1906. Amer. Ent. Soc., Trans. 32: 111. ♀.

Taxonomy: Cockerell, 1906. Ann. and Mag. Nat. Hist. (7) 17: 367. ♂.

#### Genus MELISSODES Subgenus PSILOMELISSODES LaBerge

*Melissodes* subg. *Psilomelissodes* LaBerge, 1956. Kans. Univ. Sci. Bul. 37: 1173.

Type-species: *Melissodes intorta* Cresson. Monotypic and orig. desig.

**intorta** Cresson. Kans., Tex. Pollen: Probably dependent upon the pollen of the Malvaceous genus *Callirhoe* including *C. digitata*, *C. involucrata*, *C. leiocarpa*, but also visits flowers of *Asclepias latifolia*, *Gaillardia*, *Rorippa sinuata*.

*Melissodes intorta* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 278. ♂.

*Melissodes wickhami* Cockerell, 1906. Amer. Ent. Soc., Trans. 32: 112. ♀.

Taxonomy: LaBerge, 1963. Nebr. Univ. State Mus., Bul. 4: 234 (geogr. and floral records).

#### Genus MELISSODES Subgenus CALLIMELISSODES LaBerge

*Melissodes* subg. *Callimelissodes* LaBerge, 1961. Kans. Univ. Sci. Bul. 42: 294.

Type-species: *Melissodes lupina* Cresson. Orig. desig.

**ablusa** Cockerell. Calif. (Millbrae, Bolinas).

*Melissodes metenua ablusa* Cockerell, 1926. Pan-Pacific Ent. 3: 85. ♀.

**clarkiae** LaBerge. Oreg., Calif. Pollen: Probably oligolectic on *Clarkia* including *C. amoena*, *C. biloba*, *C. cylindrica*, *C. dudleyana*, *C. gracilis albicaulis*, *C. speciosa*, *C. unguiculata*, *C. williamsonii*.

*Melissodes (Callimelissodes) clarkiae* LaBerge, 1961. Kans. Univ. Sci. Bul. 42: 315, figs. 50-53. ♀, ♂.

Biology: MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 70: 29-31 (floral relationships).

**coloradensis** Cresson. N. C., Ohio, Ind., Ill., Wis., Mo., Nebr., Kans., Wyo., Colo., N. Mex., Ariz., Utah, north. Calif. Pollen: Oligolege of Compositae, with *Helianthus* including *H. annuus*, *H. atrorubens*, *H. divaricatus*, *H. grosse-serratus*, *H. mollis*, *H. petiolaris*, *H. scaberrimus* and *H. tuberosus* as the primary source of pollen, but also visits flowers of *Cirsium discolor*, *C. lanceolatum*, *Coreopsis tripteris*, *Heliopsis helianthoides*, *H. laevis*, *Liatris pycnostachya*, *Lythrum alatum*, *Rudbeckia laciniata*, *Silphium integrifolium*, *S. laciniatum*, *S. perfoliatum*, *S. terebinthinaceum*, *Solanum*, *Solidago serotina*, *Verbena hastata*, *V. stricta*, *Vernonia baldwini interior*, *V. fasciculatum*.

*Melissodes coloradensis* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 200. ♀, ♂.

**composita** Tucker. Mont. south to Ariz., N. Mex. Ecology: Nests in ground individually, but many individuals use a communal entrance. Parasite: *Triepolus helianthi* Robt.? Pollen: Unknown, but visits flowers of *Grindelia squarrosa*, *Haplopappus gracilis*, *Thurberia thespesioides*.

*Melissodes lupina composita* Tucker, 1909. Kans. Acad. Sci., Trans. 22: 281. ♂.

Biology: Hurd and Linsley, 1959. Ent. News 70: 141-146 (nest).

**glenwoodensis** Cockerell. N. Dak. south to N. Mex., west to Wash. and southern Calif. Pollen: Oligolege of Compositae, especially *Chrysothamnus* including *C. nauseosus consimilis*, *C. n. mojaviensis*, *C. n. speciosus*, *C. viscidiflorus typicus*, but visits other flowers including *Cirsium*, *Grindelia squarrosa*, *Haplopappus vernonioides*, *Helianthus petiolaris*, *Solidago trinervata*.

*Melissodes glenwoodensis* Cockerell, 1905. Ann. and Mag. Nat. Hist. (7) 15: 522. ♀.

Taxonomy: Cockerell, 1906. Amer. Ent. Soc., Trans. 32: 107.

**lupina** Cresson. Mont. to Wash., south to Colo., Utah, Nev., Calif.; Mexico (Baja Calif.). Pollen: Oligolege of Compositae, but visits a wide variety of flowers including *Achillea*, *Adenostegia*, *Adenostoma fasciculatum*, *Arctium*, *Asclepias*, *Aster chilensis*, *A. exilis*, *Bigelovia*, *Brassica*, *Calochortus nuttalli*, *Calycadenia*, *Castanopsis*, *Centaurea solstitialis*, *Chaenactis artemisiaefolia*, *C. glabriuscula*, *Chrysopsis villosus*, *Chrysothamnus nauseosus speciosus*, *C. viscidiflorus typicus*, *Cirsium*, *Clarkia amoena*, *C. botata*, *Cleome serrulata*, *Cordylanthus*, *Coreopsis lanceolatum*, *C. tinctoris*, *Corethrogyne bernardense*, *C. filaginifolia*, *Cosmos*, *Croton californicus*, *Cryptantha intermedia*, *Cucurbita*, *Encelia*, *Epilobium*, *Eremocarpus setigerus*, *Erigeron foliosus*, *Eriodictyon angustifolium*, *Eriogonum fasciculatum*, *E. gracile*, *E. latifolium*, *Eriophyllum confertiflorum*, *Grindelia camporum*, *G. elata*, *G. squarrosa*, *Gutierrezia californica*, *G. sarothrae*, *Haplopappus arborescens*, *H. bloomeri angustatus*, *H. palmeri*, *Hemizonia fasciculata*, *H. fitchii*, *H. heermannii*, *H. lobbii*, *H. luzulaefolia*, *H. paniculata*, *H. pungens*, *H. wrightii*, *Heterotheca grandiflora*, *Holodiscus discolor*, *Iris hartwegii*, *Lessingia*, *Ligustrum*, *Limnanthes*, *Lotus*, *Lythrum californica*, *Madia*, *Malacothrix*, *Marrubium vulgare*, *Medicago sativa*, *Melilotus alba*, *M. indica*, *Monardella*, *Nemophila*, *Perezia microcephala*, *Phacelia heterophylla*, *P. humilis*, *Phalacroseris bolanderi*, *Pimpinella*, *Polygonum auberti*, *Raphanus*, *Rhamnus californica*, *Salvia carduacea*, *Senecio*, *Solidago californica*, *S. elongata*, *S. occidentalis*, *Stephanomeria exigua*, *S. virgata*, *Trichostema laxum*, *Trifolium repens*, *Verbena*, *Vicia*.

*Melissodes lupina* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 210. ♂.

*Melissodes intermediella* var. *catalinensis* Cockerell, 1905. South. Calif. Acad. Sci., Bul. 4: 102. ♀.

*Melissodes catalinensis vanduzeei* Cockerell, 1923. Calif. Acad. Sci., Proc. (4) 12: 86. ♀.

**lustra** LaBerge. Idaho, Oreg., Nev., Calif.; Mexico (Baja Calif.). Pollen: Oligolectic, depending upon plants of Compositae for pollen, particularly *Gutierrezia*, *Chrysothamnus* and *Haplopappus*, visits flowers of *Aster*, *Baccharis pilularis*, *Bigelovia*, *Chrysothamnus nauseosus nauseosus*, *C. n. consimilis*, *C. n. speciosus*, *C. viridulus*, *C. viscidiflorus typicus*, *Cleome*, *Croton californicus*, *Eriogonum latifolium*, *Grindelia camporum*, *G. sarothrae*, *Haplopappus bloomeri angustatus*, *H. palmeri*, *H. vernonioides*, *Heterotheca grandiflora*, *Melilotus alba*, *Senecio douglasii*.

*Melissodes (Callimelissodes) lustra* LaBerge, 1961. Kans. Univ. Sci. Bul. 42: 334, fig. 59. ♀, ♂.

**metenua** Cockerell. Wash. to northern Calif., Idaho, Wyo., Utah. Pollen: Unknown, but visits flowers of *Cosmos*, *Eriogonum*, *Melilotus alba*.

*Melissodes metenua* Cockerell, 1924. Pan-Pacific Ent. 1: 56. ♀.

**minuscula** LaBerge. Calif. Pollen: Unknown, but visits flowers of *Cressa cretica*, *Heliotropium curassavicum*, *Melilotus*.

*Melissodes (Callimelissodes) minuscula* LaBerge, 1961. Kans. Univ. Sci. Bul. 42: 323. ♀, ♂.

**nigracauda** LaBerge. Calif. Pollen: Unknown, but visits flowers of *Erigeron*, *Senecio douglasii*, *Stephanomeria exigua*.

*Melissodes (Callimelissodes) nigracauda* LaBerge, 1961. Kans. Univ. Sci. Bul. 42: 327, figs. 54-57. ♀, ♂.

**plumosa** LaBerge. Wash. to Calif., (?)N. Dak. Pollen: Unknown, but visits flowers of *Encelia californica*, *Helianthus petiolaris*.

*Melissodes (Callimelissodes) plumosa* LaBerge, 1961. Kans. Univ. Sci. Bul. 42: 308, figs. 42-45. ♀, ♂.

**stearnsi** Cockerell. Wash., Oreg., Calif. Pollen: Possibly an oligolege of Compositae, but visits a wide variety of flowers including *Althaea rosea*, *Asclepias eriocarpa*, *Aster exilis*, *Brassica*, *Centaurea solstitialis*, *Cirsium*, *Cleome*, *Corethrogyne bernardense*, *C. virgata*, *Cucurbita*, *Datura meteloides*, *Eremocarpus setigerus*, *Eriogonum setiger*, *Gilia virgata*, *Grindelia*, *Gutierrezia californica*, *G. sarothrae*, *Haplopappus palmeri*, *H. parishii*, *Helianthus annuus*, *Heliotropium curassavicum*, *Hemizonia fasciculata*, *H. pungens*, *Hugelia virgata*, *Marrubium vulgare*, *Medicago sativa*, *Melilotus*, *Navarretia*, *Phacelia*, *Silphium marianum*, *Trichostema lanceolatum*.

*Melissodes stearnsi* Cockerell, 1905. South. Calif. Acad. Sci., Bul. 4: 101. ♀.

**tribas** LaBerge. Calif. (San Diego).

*Melissodes (Callimelissodes) tribas* LaBerge, 1961. Kans. Univ. Sci. Bul. 42: 326. ♀.

**tuckeri** Cockerell. Mont., S. Dak., Nebr., Kans., Tex. Pollen: Unknown, but visits flowers of *Aster*, *Heterotheca subaxillaris*.

*Melissodes Tuckeri* Cockerell, 1909. Canad. Ent. 41: 129. ♀.

### Genus MELISSODES Subgenus UNASSIGNED

**scotti** Cockerell. Calif. (San Clemente Isl.).

*Melissodes scotti* Cockerell, 1939. Calif. Acad. Sci., Proc. (4) 23: 430. ♀.

#### UNRECOGNIZED SPECIES OF THE GENUS MELISSODES LATREILLE

The types of the below listed are either lost or destroyed (see LaBerge, 1961. Kans. Univ. Sci. Bul. 42: 654).

**americana** (Lepeletier). Carolina, Ill.

*Macrocera americana* Lepeletier, 1841. Hist. Nat. Ins., Hym., v. 2, p. 92. ♂.

**intermedia** Cresson. Tex.

*Melissodes intermedia* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 278. ♀.

**pennsylvanica** (Lepeletier). Pa.

*Macrocera pennsylvanica* Lepeletier, 1841. Hist. Nat. Ins., Hym., v. 2, p. 97. ♂.

**philadelphica** (Lepeletier). Pa.

*Macrocera Philadelphica* Lepeletier, 1841. Hist. Nat. Ins., Hym., v. 2, p. 110. ♂.

#### NOMINA NUDA IN THE GENUS MELISSODES LATREILLE

*Melissodes maura* Bray, 1917. Jour. Ent. Zool. 9: 94.

*Melissodes pullata* Bray, 1917. Jour. Ent. Zool. 9: 94.

### Genus FLORILEGUS Robertson

Revision: Urban, 1970. Bol. Parana Univ. Federal, Zool. 3 (12): 245-280, 4 figs. (included spp.).

#### Genus FLORILEGUS Subgenus FLORILEGUS Robertson

*Florilegus* Robertson, 1900. Acad. Sci. St. Louis, Trans. 10: 53.

Type-species: *Melissodes condigna* Cresson. Monotypic.

**condignus** (Cresson). N. J. to Fla., west to Nebr., Colo., N. Mex., south to Argentina. Pollen:

Polylectic, visits a wide variety of flowers in the United States where it exhibits a preference for those of the Leguminosae and particularly *Medicago sativa*.

*Melissodes condigna* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 207. ♀.

*Melissodes palustris* Robertson, 1892. Amer. Nat. 26: 273. ♂.

*Tetralonia quadrata* Bertoni and Schrottky, 1910. Zool. Jahrb., Abt. f. Syst. p. 572. ♂, ♀.

*Florilegus pavoninus* Cockerell, 1914. N. Y. Ent. Soc., Jour. 22: 316. ♀.

*Florilegus barticanus* Cockerell, 1918. Amer. Mus. Nat. Hist. Bul. 38: 690. ♂.

*Tetralonia ecuadoria* Friese, 1923. Arkiv. f. Zool. 15 (13): 3. ♂, ♀.

Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 253-255, fig. 78

(redescription). —LaBerge and Ribble, 1966. Ent. Soc. Amer., Ann. 59: 948-949, figs. 8-11 (cocoon, larva).

Biology: LaBerge and Ribble, 1966. Ent. Soc. Amer., Ann. 59: 944-950, 11 figs., 1 table (nesting behavior, nest architecture, floral relationships).

#### Genus GAESISCHIA Michener, LaBerge and Moure

Revision: Urban, 1963. Bol. Parana Univ. Federal, Zool. 3 (4): 79-129, 7 figs., 1 map, 2 tables (included spp.).

Taxonomy: LaBerge, 1958. Pan-Pacific Ent. 34: 195-201, 3 figs. (diagnostic characteristics, classification).



**Genus GAESISCHIA Subgenus GAESISCHIA Michener, LaBerge and Moure**

*Gaeschia* Michener, LaBerge and Moure, 1955. *Dusen* 6: 220.

Type-species: *Suastra fulgurans* Holmberg. Orig. desig.

*Gaeschia* Subgenus *Prodasychnalonia* LaBerge, 1958. *Pan-Pacific Ent.* 34: 199.

Type-species: *Gaeschia mexicana* LaBerge. Monotypic and orig. desig.

The typical subgenus occurs south of the United States.

**Genus GAESISCHIA Subgenus GAESISCHIANA Michener, LaBerge and Moure**

*Gaeschia* subg. *Gaeschiana* Michener, LaBerge and Moure, 1955. *Dusen* 6: 224.

Type-species: *Gaeschia (Gaeschiana) exul* Michener, LaBerge and Moure. Orig. desig.

*Gaeschia* subg. *Agaeschia* Moure and Michener, 1955. *Dusen* 6: 273.

Type-species: *Eucera patellicornis* Ducke. Orig. desig.

*exul* Michener, LaBerge and Moure. *Ariz. to Colombia*. Pollen: Polylectic, visits flowers of *Andira inermis*, *Caesalpinia eriostachys*, *Dalbergia retusa*, *Myrospermum frutescens*, *Parkinsonia aculeata*, *Piscidia carthagenensis*, *Pterocarpus rohrii*.

*Gaeschia (Gaeschiana) exul* Michener, LaBerge and Moure, 1955. *Dusen* 6: 224. ♂.

Taxonomy: LaBerge, 1958. *Pan-Pacific Ent.* 34: 198. ♀.

Biology: Frankie and Baker, 1974. *An. Inst. Nac. Univ. Auton. Mexico* 45, ser. *Botanica* 1: 4-5, 1 fig., 1 table (group foraging). —Jones and Buchmann, 1974. *Anim. Behaviour* 22: 483, tables 1, 2 (u. v. floral patterns as orientation cues). —Frankie, Opler and Bawa, 1976. *Jour. Ecol.* 64: 1049-1057, 1 fig., 4 tables (foraging behavior).

**Genus SIMANTHEDON Zavortink**

*Simanthedon* Zavortink, 1975. *Calif. Acad. Sci., Proc.* 40: 232.

Type-species: *Simanthedon linsleyi* Zavortink. Monotypic and orig. desig.

*linsleyi* Zavortink. *Southeastern Ariz. (Cochise Co.), N. Mex. (Eddy Co.); Mexico (Durango)*.

Pollen: Polylectic, especially *Menodora scabra*, *Agave palmeri*, *Datura meteloides*, *Polygala racemosa*, but also visits other flowers for nectar and or pollen including *Cevallia sinuata*, *Conyza*, *Desmanthus cooleyi*, *Hoffmanseggia densiflora*, *Ipomoea hirsutula*, *Mentzelia pumila*, *Salvia reflexa*, *Solanum elaeagnifolium*.

*Simanthedon linsleyi* Zavortink, 1975. *Calif. Acad. Sci., Proc.* 40: 236, 2 figs. ♂, ♀.

**Genus MARTINAPIS Cockerell****Genus MARTINAPIS Subgenus MARTINAPIS Cockerell**

Another subgenus, *Svastropsis* Moure and Michener, is found in Argentina.

*Melissodes* subg. *Martinella* Cockerell, 1903. *Ann. and Mag. Nat. Hist.* (7) 12: 450. Preocc.

Type-species: *Melissodes luteicornis* Cockerell. Monotypic.

*Martinapis* Cockerell, 1929. *Entomologist* 62: 19. N. name.

Revision: Zavortink and LaBerge, 1976. *Wasmann Jour. Biol.* 34: 119-145, 2 figs., 3 tables (included spp.).

*luteicornis* (Cockerell). *Kans. (Dodge City), west. Tex., N. Mex. and east. Ariz. (Cochise and Graham Counties); Mexico (Chihuahua and Durango)*. Pollen: Polylectic, seems to prefer to visit plants in the families Leguminosae and Zygophyllaceae for pollen and nectar including *Dalea*, *Hoffmanseggia*, *Larrea*, and *Petalostemon*, although a female has been recorded collecting pollen from *Solanum elaeagnifolium*; visitation records include flowers of *Acacia*, *Andropus carnosus*, *Baileya multiradiata*, *Cevallia sinuata*, *Chilopsis linearis*, *Chrysothamnus*, *Dalea lanata*, *D. scoparia*, *D. terminalis*, *Datura innoxia*, *Fallugia paradoxa*, *Gaura suffulta*, *Hoffmanseggia glauca*, *Larrea tridentata*, *Lygodesmia juncea*, *Melilotus alba*, *Mentzelia multiflora*, *Petalostemon*, *Prosopis glandulosa* var. *torreyana*, *Solidago occidentalis*, *Tribulus*, *Verbesina encelioides*, *Xanthisma texanum*.

*Melissodes luteicornis* Cockerell, 1896. *Ann. and Mag. Nat. Hist.* (6) 18: 293. ♂.

Taxonomy: Zavortink and LaBerge, 1976. Wasmann Jour. Biol. 34: 130-140, fig. 2 (redescription).

Biology: Linsley and Hurd, 1959. Ent. News 70: 67 (pollen source). — Linsley and Cazier, 1970. Kans. Ent. Soc., Jour. 43: table 1 (pollen source). — Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 41, tables 1, 3, 4, 6, 8 (floral relationship with *Larrea*, as *luteicornis*). — Zavortink and LaBerge, 1976. Wasmann Jour. Biol. 34: 140-143, tables 1-3 (floral relationships, seasonal periods of activity).

**occidentalis** Zavortink and LaBerge. South. Calif. (Colorado and south. Mojave Deserts), and southwest. Ariz. (Lower Colorado Valley); Mexico (Baja California and Sonora). Pollen: Polylectic, seems to prefer to visit plants in the families Compositae, Leguminosae, Solanaceae and Zygophyllaceae for pollen and nectar including *Cercidium*, *Dalea*, *Datura*, *Larrea*, *Palafoxia*, *Solanum*; floral visitation records include *Cercidium floridum*, *Dalea emoryi*, *Encelia*, *Helianthus niveus*, *Larrea tridentata*, *Palafoxia linearis*, *Wislizenia refracta*.

*Martinapis occidentalis* Zavortink and LaBerge, 1976. Wasmann Jour. Biol. 34: 121, figs. 1, 2. ♂, ♀.

Biology: MacSwain, 1957. Pan-Pacific Ent. 33: 70 (floral relationships, as *luteicornis*). — Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 41, table 12 (floral relationship with *Larrea*, as *luteicornis* in part). — Zavortink and LaBerge, 1976. Wasmann Jour. Biol. 34: 128-129 (floral relationships, daily and seasonal periods of activity).

### Genus MELISSOPTILA Holmberg

Revision: Urban, 1968. Rev. Brasil. Ent. 13: 1-94, 70 figs., 3 maps (included spp.).

Taxonomy: LaBerge, 1957. Amer. Mus. Novitates 1837: 37-38 (tax. characters).

#### Genus MELISSOPTILA Subgenus MELISSOPTILA Holmberg

*Melissoptila* Holmberg, 1884. Cordoba. Acad. Nac. de Cien., Actas 5: 119.

Type-species: *Melissoptila tandilensis* Holmberg. Monotypic.

*Thyreotremata* Holmberg, 1887. Cordoba. Acad. Nac. de Cien., Bol. 10: 225. Nomen nudum.

*Thyreothremma* Holmberg, 1903. Mus. Nac. Buenos Aires, An. (3) 2: 391.

Type-species: *Melissoptila tandilensis* Holmberg. Desig. by Sandhouse, 1943.

(= *Thyreothremma rhopalocera* Holmberg).

The typical subgenus does not occur in North America.

#### Genus MELISSOPTILA Subgenus PTILOMELISSA Moure

*Ptilomelissa* Moure, 1943. Rev. de Ent. 14: 482.

Type-species: *Ptilomelissa ochromelaena* Moure. Monotypic.

**otomita** (Cresson). Tex. (Brownsville); Mexico, Guatemala, Honduras, Costa Rica, Panama.

*Melissodes otomita* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 209. ♂.

*Melissodes pinguis* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 216. ♀, ♂.

*Melissodes pinguis* var. *velutinella* Cockerell, 1897. Amer. Ent. Soc., Trans. 24: 158. ♀.

*Tetralonia joseana* Friese, 1916. Stettin. Ent. Ztg. 77: 330. ♂, ♀.

*Exomalopsis rufitecta* Cockerell, 1949. U. S. Natl. Mus., Proc. 98: 454. ♀.

*Exomalopsis rufitecta* var. *palliditecta* Cockerell, 1949. U. S. Natl. Mus., Proc. 98: 454. ♀.

Taxonomy: LaBerge, 1957. Amer. Mus. Novitates 1837: 38 (synonymy, selects *otomita* instead of *pinguis* under provision of first reviser). — Urban, 1968. Rev. Brasil. Ent. 13: 67-71, figs. 29, 44, 53-65, map 1 (as *pinguis*).

Morphology: Graf, 1970. Bol. Federal Univ. Parana, Zool. 3: 281-287, 1 pl., figs. 1-3 (salivary glands).

### ☛ TRIBE ANTHOPHORINI

This is a large tribe of pollen-collecting bees that is found throughout much of the world. Although the Anthophorini contains several genera, most of the species belong to the Old World

genus *Amegilla* and the genus *Anthophora* which occurs on all the continents except Australia. In the New World the tribe is represented by the apparently endemic, North American *Deltoptila* and *Emphoropsis* and by *Anthophora* which, although present in both North and South America, is especially well represented by numerous species in North America. While most of the studied Anthophorini nest in the ground, at least members of the subgenus *Clisodon* make their nests in wood.

### Genus ANTHOPHORA Latreille

**Taxonomy:** Cockerell, 1906. Amer. Ent. Soc., Trans. 32: 64-72. — Michener, 1936. Amer. Mus. Novitates 876: 1-2 (small group only). — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 323-331, figs. 90-93 (eastern U. S. spp.).

### Genus ANTHOPHORA Subgenus ANTHOPHORA Latreille

*Podalirius* Latreille, 1802. Hist. Nat. Fourmis, p. 430. Name suppressed by Internatl. Comn. Zool. Nomencl., Op. 151, 1944.

*Anthophora* Latreille, 1803. Nouv. Dict. Hist. Nat., v. 18, p. 167. Proposed unnecessarily to replace *Podalirius* Latreille.

Type-species: *Apis acervorum* Linnaeus. Desig. by Internatl. Comn. Zool. Nomencl., Op. 151, 1944. (= *Apis pilipes* Fabricius).

*Lasius* Panzer, [1801-1802]. Faunae Ins. German., h. 86, no. 16. Name suppressed by Internatl. Comn. Zool. Nomencl., Op. 151, 1944.

*Podalirius* subg. *Paramegilla* Friese, 1897. Die Bienen Europas, v. 3, p. 18.

Type-species: *Apis ireos* Pallas. Desig. by Sandhouse, 1943.

*Anthophoroides* Cockerell and Cockerell, 1901. Ann. and Mag. Nat. Hist. (7) 7: 48.

Type-species: *Podalirius vallorum* Cockerell. Monotypic and orig. desig.

*Anthemoessa* Robertson, 1905. Amer. Ent. Soc., Trans. 31: 372. Preocc.

Type-species: *Anthophora abrupta* Say. Monotypic and orig. desig.

*Melea* Sandhouse, 1943. U. S. Natl. Mus., Proc. 92: 526. N. name.

**Taxonomy:** Timberlake, 1951. N. Y. Ent. Soc., Jour. 59: 51-62 (western U. S. spp.). — Michener, 1960. Queensland Nat. 16: 63 (status of *Amegilla*).

**abrupta** Say, N. Y. to Fla., west to Mich., south to La. and Tex. Parasite: *Hornia m. minutipennis* Riley, *Monodontomerus mandibularis* Gahan, *M. montivagus* Ashm., *Physocephala sagittaria* (Say), *Xeromelecta californica* (Cress.), *X. interrupta* (Cress.). Pollen: Unknown, but visits a wide variety of flowers including *Aesculus*, *Asclepias*, *Azalea*, *Blephilia*, *Cirsium*, *Convolvulus*, *Cornus*, *Delphinium*, *Dianthera*, *Diospyros*, *Franseria*, *Gillenia*, *Hydrophyllum*, *Iris*, *Leonurus*, *Melilotus*, *Mertensia*, *Monarda*, *Nepeta*, *Oenothera*, *Penstemon*, *Polygonatum*, *Rosa*, *Rubus*, *Scutellaria*, *Stachys*, *Teucrium*, *Trifolium*, *Triosteum*, *Vicia*.

*Anthophora abrupta* Say, 1837. Boston Jour. Nat. Hist. 1: 409. ♂.

*Anthophora sponsa* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 339. ♀.

**Taxonomy:** Michener, 1953. Kans. Univ. Sci. Bul. 35: 1080, figs. 232, 233 (larva).

**Biology:** Walsh, 1868. Amer. Ent. 1: 9 (as *sponsa*). — Ashmead, 1894. Psyche 7: 25. — Frison, 1922. Amer. Ent. Soc., Trans. 48: 137-156. — Rau, 1922. Acad. Sci. St. Louis, Trans. 24 (7): 35. — Rau, 1926. Acad. Sci. St. Louis, Trans. 25: 166. — Rau, 1929. Jour. Compar. Psychol. 9: 53. — Rau, 1929. Psyche 36: 156.

**abruptella** Cockerell. Calif. Parasite: *Sphaerophthalma unicolor* (Cress.). Pollen: Unknown, but visits flowers of *Amsinckia intermedia*, *Eriodictyon californicum*, *Phacelia distans*, *P. ramosissima*.

*Anthophora abruptella* Cockerell, 1906. Amer. Ent. Soc., Trans. 32: 72. ♀.

**affabilis** Cresson. Calif., Utah, Colo., N. Mex., Tex. Pollen: Collects pollen from flowers of *Camissonia clavaeformis*, *Oenothera caespitosa*, *O. deltoides*.

*Anthophora affabilis* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 189. ♂, ♀.

**aterrima** Cockerell. Calif. Pollen: Unknown, but visits flowers of *Satureja douglasii*, *Thermopsis macrophyllum*.

*Anthophora aterrima* Cockerell, 1924. Pan-Pacific Ent. 1: 51. ♀, ♂.

- bomboides bomboides** Kirby. Ont. to Ga., west to Wis. and Man. Parasite: *Monodontomerus mandibularis* Gahan. Pollen: Unknown, but visits flowers of *Ceanothus*, *Penstemon*.  
*Anthophora bomboides* Kirby, 1837. In Richardson, Faune Bor.-Amer., v. 4, p. 271. ♂.  
*Anthophora canadensis* Cresson, 1869. Amer. Ent. Soc., Trans. 2: 292. ♂.
- Taxonomy: Cockerell, 1936. Canad. Ent. 68: 276 (key to this and following subspecies of *bomboides*).
- bomboides neomexicana** Cockerell. S. Dak., Wyo., Idaho, Colo., N. Mex., Calif. (Mono Co.), ?Nebr., ?Tex. Parasite: *Hornia neomexicana* (Ckll.), *Monodontomerus montivagus* Ashm., *Sphaerophthalma unicolor* (Cress.), *Xeromelecta californica* (Cress.).  
*Anthophora bomboides* var. *neomexicana* Cockerell, 1900. Ann. and Mag. Nat. Hist. (7) 5: 408. ♂, ♀.
- Biology: Hicks, 1926. Colo. Univ., Studies 15: 224 (nest). — Hicks, 1931. Canad. Ent. 63: 175 (nest, parasite).
- bomboides scutellaris** Swenk. Nebr., Colo.  
*Anthophora scutellaris* Swenk, 1909. Ent. News 20: 391. ♀.
- bomboides sodalis** Cresson. Wash., Oreg., east. Calif., Nev., ?Man., ?Alta.  
*Anthophora sodalis* Cresson, 1879. Amer. Ent. Soc., Trans. 7: 212. ♂.
- bomboides solitaria** Ritsema. B. C., ?Calif.  
*Anthophora insularis* Smith, 1879 (not 1857). Descr. New Species Hym. Brit. Mus., p. 124. ♀. Preocc.  
*Anthophora solitaria* Ritsema, 1880. Tijdschr. v. Ent. 23: xcvi. N. name.
- Taxonomy: Cockerell, 1905. Amer. Ent. Soc., Trans. 31: 331.
- bomboides stanfordiana** Cockerell. B. C., Wash., Oreg., Calif. Parasite: *Dasymutilla aureola* (Cress.), *Hornia minutipennis occidentalis* Linsley, *Xeromelecta californica* (Cress.). Pollen: Unknown, but visits flowers of *Castilleja latifolia*, *Delphinium* including *D. hesperium*, *Dudleya*, *Eriodictyon californicum*, *Glycyrrhiza lepidota*, *Penstemon*, *Phacelia distans*, *P. imbricata*, *Raphanus sativa*, *Rosa californica*, *Stanleya pinnata*.  
*Anthophora stanfordiana* Cockerell, 1904. Ent. News 15: 32. ♂, ♀.
- Taxonomy: Michener, 1953. Kans. Univ. Sci. Bul. 35: 1007, 1078, figs. 7-15, 219-222, 225 (larva).
- Biology: Kellogg, 1908. Amer. Ins., p. 517. — Nininger, 1920. Psyche 27: 135. — Linsley and MacSwain, 1942. Calif. Univ. Pubs. Ent. 7: 189 (habits).
- bomboides willingi** Cockerell. Sask.  
*Anthophora bomboides Willingi* Cockerell, 1911. Canad. Ent. 43: 34. ♂.
- californica albomarginata** Timberlake. Ariz., Calif., desert. Pollen: Unknown, but visits flowers of *Aster spinosa*, *Chilopsis linearis*, *Dalea*, *Heliotropium curassavicum*, *Larrea tridentata*, *Phyla nodiflora*, *Prosopis glandulosa*, *Salvia columbariae*.  
*Anthophora californica albomarginata* Timberlake, 1937. Amer. Mus. Novitates 958: 13. ♀, ♂.
- californica californica** Cresson. Colo., N. Mex., Ariz., Calif.; Mexico (Baja Calif.). Pollen: Unknown, but visits a wide variety of flowers including *Amsinckia douglasiana*, *A. intermedia*, *Astragalus pomonensis*, *Castilleja latifolia*, *Cercidium floridum*, *Dalea californica*, *Dudleya aloides*, *Eriodictyon californicum*, *Isomeris arborea*, *Lantana montevidensis*, *Lotus scoparius*, *Lupinus*, *Oenothera*, *Penstemon spectabilis*, *Phacelia distans*, *P. imbricata*, *Pholisma racemosa*, *Raphanus sativus*, *Rubus ursinus*, *Salvia columbariae*, *S. mellifera*, *Scrophularia californica*, *S. laciniata*, *Senecio douglasii*, *Solanum xanthii*.  
*Anthophora californica* Cresson, 1869. Amer. Ent. Soc., Trans. 2: 290. ♂.  
*Anthophora 5-fasciata* Provancher, 1895. Nat. Canad. 22: 172. ♂.  
*Anthophora tarsata subtarsata* Cockerell, 1904. South. Calif. Acad. Sci., Bul. 3: 88. ♂, ♀.
- Taxonomy: Cockerell, 1897. Amer. Ent. Soc., Trans. 24: 154. ♂.
- californica erysimi** Cockerell. Calif. (San Miguel Is.). Pollen: Unknown, but visits flowers of *Erysimum insulare*.  
*Anthophora californica erysimi* Cockerell, 1937. Pan-Pacific Ent. 13: 150. ♀.

- californica texana** Cresson. Colo., N. Mex., Ariz., Tex.; Mexico (Zacatecas). Pollen: Unknown, but visits flowers of *Caesalpinia falcaria*, *Chilopsis linearis*, *Larrea tridentata*.  
*Anthophora texana* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 282. ♀.
- Taxonomy: Cockerell, 1905. Canad. Ent. 37: 335. ♂.
- capistrata** Cresson. Tex.; ?Mexico (Baja Calif.).  
*Anthophora capistrata* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 187. ♂.
- centriformis centriformis** Cresson. Nev., Calif. (Sierra Nevada Mts.).  
*Anthophora centriformis* Cresson, 1879. Amer. Ent. Soc., Trans. 7: 212. ♂.
- centriformis vierecki** Cockerell. N. Mex., Nev., Calif. Pollen: Unknown, but visits flowers of *Beloperone californica*, *Hyptis emoryi*, *Lotus scoparius*, *Lupinus odoratus*, *Nama parryi*, *Penstemon spectabilis*, *Scutellaria angustifolia*.  
*Anthophora centriformis vierecki* Cockerell, 1906. Amer. Ent. Soc., Trans. 32: 69. ♂.
- chlorops chlorops** Michener. Wash.  
*Anthophora chlorops* Michener, 1936. Brooklyn Ent. Soc., Bul. 31: 92. ♀.
- chlorops utahensis** Michener. Utah.  
*Anthophora chlorops utahensis* Michener, 1936. Amer. Mus. Novitates 876: 2. ♀.
- citreostrigata** Dours. North America. (No recent records; doubtless not Nearctic).  
*Anthophora citreo-strigata* Dours, 1868. Soc. Linn. Nord France, Mem. 71: 95. ♀.
- coptognatha** Timberlake. Ariz., Calif. deserts. Pollen: Unknown, but visits flowers of *Dalea fremontii*, *Lantana*, *Larrea tridentata*, *Lycium*, *Prosopis*, *Salvia pilosa*.  
*Anthophora coptognatha* Timberlake, 1951. N. Y. Ent. Soc., Jour. 59: 54. ♂, ♀.
- crotchii** Cresson. B. C., Wash., Calif. Pollen: Unknown, but visits a wide variety of flowers including *Amsinckia douglasiana*, *A. eastwoodae*, *A. intermedia*, *Astragalus*, *Brassica*, *Brodiaea capitata*, *Caulanthus heterophyllus*, *Delphinium parryi*, *Eriodictyon*, *Lantana montevidensis*, *Lupinus*, *Marrubium vulgare*, *Oenothera*, *Orthocarpus purpurascens*, *Raphanus sativus*, *Salvia carduacea*, *S. columbariae*, *Trichostema parishii*.  
*Anthophora crotchii* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 192. ♂.  
*Anthophora Washingtoni* Cockerell, 1905. In Viereck, Canad. Ent. 37: 313. ♀.
- Taxonomy: Cockerell, 1904. South. Calif. Acad. Sci., Bul. 3: 161. ♂.
- dammersi** Timberlake. Calif. Pollen: Collects pollen from flowers of *Camissonia kernensis*, but also visits flowers of *Amsinckia douglasiana*, *A. intermedia*, *Eleperone californica*, *Chaenactis fremontii*, *Salazaria mexicana*, *Salvia carduacea*.  
*Anthophora dammersi* Timberlake, 1937. Amer. Mus. Novitates 958: 15. ♂, ♀.
- edwardsii edwardsii** Cresson. Wash. to Calif., Nev. and Utah. Parasite: *Anthrax* sp. near *fur* O. S., *Dasymutilla aureola* (Cress.), *Melecta separata callura* (Ckll.), *Meloe franciscana* Van Dyke, *Mythicomymia* sp. near *pusilla* Melander, *Nemognatha scutellaris* LeC., *Sphaerophthalma unicolor* (Cress.), *Tricrania stansburyi* Hald., *Xeromelecta californica* (Cress.). Pollen: Collects pollen from *Amsinckia* and *Astragalus*, but visits these and a wide variety of other flowers for nectar including *Brassica*, *Brodiaea*, *Cryptantha*, *Erodium*, *Eriogonum*, *Lantana*, *Layia*, *Lupinus*, *Mentzelia*, *Orthocarpus*, *Phacelia*, *Plagiobothrys*, *Prunus*, *Raphanus*, *Ribes*, *Salix*, *Salvia*, *Solanum*. Predator: *Anthrenus scrophulariae* (L.). *Ptinus californicus* Pic.  
*Anthophora edwardsii* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 190. ♀, ♂.
- Taxonomy: Michener, 1958. Kans. Univ. Sci. Bul. 35: 1082, figs. 228, 234, 235 (larva).  
 —Timberlake, 1951. N. Y. Ent. Soc., Jour. 59: 62.
- Biology: Linsley and MacSwain, 1941. South. Calif. Acad. Sci., Bul. 40: 130. —Thorp, 1969. Amer. Midland Nat. 82: 321-337, 7 figs., 1 map, 2 tables (nest, flight behavior, flower relationships, enemies).
- edwardsii gohrmanae** Cockerell. Colo., N. Mex., Calif.  
*Anthophora gohrmanae* Cockerell, 1903. Ann. and Mag. Nat. Hist. (7) 12: 454. ♂.  
*Anthophora gohrmanae* var. *coloradensis* Michener, 1936. Brooklyn Ent. Soc., Bul. 31: 92. ♂, ♀.
- Taxonomy: Timberlake, 1951. N. Y. Ent. Soc., Jour. 59: 62.

**fedorica** Cockerell. Tex.

*Anthophora fedorica* Cockerell, 1906. Amer. Ent. Soc., Trans. 32: 70. ♂.

Taxonomy: Cockerell, 1908. Ent. Soc. Wash., Proc. 9: 71. ♀.

**forbesi** Cockerell. Ariz., Calif. (Death Valley), Mexico (Baja Calif.). Parasite: *Melecta separata arizonica* (Ckll.). Pollen: Unknown, but visits flowers of *Larrea tridentata*.

*Anthophora forbesi* Cockerell, 1907. Canad. Ent. 39: 354. ♀.

Taxonomy: Timberlake, 1951. N. Y. Ent. Soc., Jour. 59: 59. ♂.

Biology: Lutz and Cockerell, 1920. Amer. Mus. Nat. Hist., Bul. 42: 574 (parasite).

**frontata** Say. La.

*Anthophora frontata* Say, 1837. Boston Jour. Nat. Hist. 1: 409. ♂.

**fulvicauda** Timberlake. Calif. Pollen: Collects pollen from flowers of *Camissonia clavaeformis*, but also visits flowers of *Chilopsis linearis*, *Eriodictyon crassifolium*, *Stephanomeria exigua*.

*Anthophora fulvicauda* Timberlake, 1937. Amer. Mus. Novitates 958: 14. ♀, ♂.

**fulvicollis** Timberlake. Calif., Ariz. Pollen: Collects pollen from flowers of *Camissonia clavaeformis*.

*Anthophora fulvicollis* Timberlake, 1951. N. Y. Ent. Soc., Jour. 59: 59. ♂.

**fumipennis** Swenk. Nebr.

*Anthophora fumipennis* Swenk, 1909. Ent. News 20: 391. ♀.

**fuscipennis** Smith. North America. (No recent records).

*Anthophora fuscipennis* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 338. ♀.

**lesquerellae** (Cockerell). N. Mex. Pollen: Unknown, but visits flowers of *Lesquerella fendleri*, *Lycium*, *Ungnadia speciosa*.

*Podalirius lesquerellae* Cockerell, 1896. Canad. Ent. 28: 197. ♀, ♂.

Taxonomy: Cockerell, 1897. Ann. and Mag. Nat. Hist. (6) 19: 399. ♂.

**linsleyi** Timberlake. South. Calif., arid regions. Parasite: *Anthrax nidicola* Cole, *Hornia boharti* Linsley, *Hylemya cilicrura* Rond., *Lytta chloris* Fall, *L. occipitalis* Horn, *L. purpurascens* Fall, *Monodontomerus montivagus* Ashm., *Myopa rubida* (Bigot), *Nemognatha scutellaris* LeC., *Sphaerophthalma unicolor* (Cress.), *Triepeolus mojaviensis* Linsley, *Xeromelecta californica* (Cress.). Pollen: Primarily associated with flowers of *Salvia carduacea*, but also visits flowers of *Amsinckia intermedia*, *Dalea saundersii*, *D. schottii*, *Larrea tridentata*, *Lupinus odoratus*, *Monardella exilis*, *Phacelia distans*, *Salazaria*. Predator: *Ptinus californicus* Pic, *Trogoderma ajax* Casey, *T. simplex* Jayne.

*Anthophora linsleyi* Timberlake, 1941. Pan-Pacific Ent. 17: 34. ♂, ♀.

Taxonomy: Michener, 1953. Kans. Univ. Sci. Bul. 35: 1082, figs. 227, 236, 237 (larva).

Biology: Linsley and MacSwain, 1942. Amer. Midland Nat. 27: 402-417 (parasites, predators, scavengers). —Ferguson, 1962. Calif. Univ. Pubs. Ent. 27: 76 (parasites). —Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 43 (nest, floral relationships).

**marginata** Smith. N. Mex., Ariz.; Mexico.

*Anthophora marginata* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 339. ♀.

Taxonomy: Cockerell, 1905. Amer. Ent. Soc., Trans. 31: 331. ♀, ♂.

**montana** Cresson. Colo., Tex., N. Mex., Ariz. Parasite: *Sphaerophthalma unicolor* (Cress.).

Pollen: Unknown, but visits flowers of *Cleome serrulata*, *Delphinium*, *Lycium vulgare*, *Mentzelia pumila*, *Salvia lanceolata*.

*Anthophora montana* Cresson, 1869. Amer. Ent. Soc., Trans. 2: 290. ♀.

Biology: Linsley, 1962. Ent. Soc. Amer., Ann. 55: 161, fig. 9.

**nebracensis** Swenk. Nebr. Pollen: Unknown, but visits flowers of *Monarda fistulosa*.

*Anthophora nebracensis* Swenk, 1909. Ent. News 20: 390. ♀.

**neglecta** Timberlake and Cockerell. Calif. Pollen: Collects pollen from flowers of *Camissonia clavaeformis*, but also visits flowers of *Abronia villosa*, *Amsinckia douglasiana*, *A. intermedia*, *A. tessellata*, *Acamptopappus sphaerocephalus*, *Arctostaphylos*, *Astragalus*

*pomonensis*, *Delphinium*, *Ephedra*, *Isomeris arborea*, *Lantana montevidensis*, *Lotus rigidus*, *Lupinus bicolor*, *Melilotus alba*, *Phacelia distans*, *Ranunculus*, *Rhus ovata*, *Salix*, *Salvia columbariae*, *S. pilosa*, *Sisymbrium irio*, *Trichostema lanatum*.  
*Anthophora neglecta* Timberlake and Cockerell, 1936. In Cockerell, Amer. Mus. Novitates 831: 4. ♂, ♀.

**nigrita** Dours. "Indiana." No recent records; probably not North American.

*Anthophora nigrita* Dours, 1869. Soc. Linn. Nord France, Mem. 2: 137. ♂.

*Podilirius nigratus*(!) Dalla Torre, 1896. Cat. Hym., v. 10, p. 278.

Taxonomy: Moure, 1960. Studia Ent. 3: 118-119 (status of *A. nigrita* (Fabr.) and *A. nigrita* Dours).

**occidentalis** Cresson. B. C., Mont., S. Dak., Oreg., Wyo., Kans., Colo., Utah, N. Mex., Ariz.

Parasite: *Anthrax fur* (O. S.), *Chrysura smaragdicolor* (Walk.), *Dasymutilla dugesii* (Ckll. and Casad), *D. fulvohirta* (Cress.), *Hornia m. minutipennis* Riley, *H. neomexicana* (Ckll.), *Monodontomerus montivagus* Ashm., *Nemognatha lurida* Cress., *N. piezata* Fabr., *Sphaerophthalma unicolor* (Cress.), *Triepeolus* sp., *Xeromelecta californica* (Cress.). Pollen: Unknown, but visits flowers of *Carduus*, *Cleome serrulata*, *Convolvulus sepium*.

*Anthophora occidentalis* Cresson, 1869. Amer. Ent. Soc., Trans. 2: 292. ♀, ♂.

Biology: Johnson, 1903. Ent. News 14: 290. —Hungerford and Williams, 1912. Ent. News 23: 259. —Long, 1925. Carnegie Inst. Wash., Yearbook 24: 340. —Mickel, 1928. Ent. News 39: 69. —Porter, 1951. Iowa State Coll. Jour. Sci. 26: 23-30, 19 figs. —Hobbs, Nummi and Virotek, 1961. Canad. Ent. 93: 142-148 (nests, nesting site, nest associates).

**pacifica infernalis** (Dalla Torre). Utah, Nev., south. Calif. Parasite: *Melecta pacifica fulvida* Cress. Pollen: Unknown, but visits flowers of *Amsinckia intermedia*, *Arctostaphylos glandulosa*, *A. glauca*, *Buddleia*, *Lantana montevidensis*, *Lupinus bicolor*, *Pedicularis densiflora*, *Rhus laurina*, *Ribes indecorum*, *R. nevadensis*, *R. speciosum*, *Solanum douglasii*.

*Anthophora carbonaria* Cresson, 1879. Amer. Ent. Soc., Trans. 7: 210. ♀. Preocc.

*Podalirius infernalis* Dalla Torre, 1896. Cat. Hym., v. 10, p. 273. N. name.

*Anthophora corvicolor* Cockerell, 1905. Ent. News 16: 81. ♀.

**pacifica pacifica** Cresson. B. C., Wash., Oreg., north. Calif., Nev. Pollen: Unknown, but visits flowers of *Arctostaphylos glauca*, *Cercocarpus ledifolius*, *Cynoglossum grandis*, *Eriodictyon californicum*, *Erodium botrys*, *Lantana montevidensis*, *Lasthenia chrysostoma*, *Lotus glaber*, *Lupinus bicolor*, *L. densiflorus*, *Pedicularis densiflora*, *Ribes indecorum*, *R. malvaecum*, *Salix lasiolepis*.

*Anthophora pacifica* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 190. ♂.

*Anthophora ignava* Cresson, 1879. Amer. Ent. Soc., Trans. 7: 210. ♀.

**pernicis** Timberlake. Ariz., Nev. Pollen: Unknown, but visits flowers of *Ribes cereum*.

*Anthophora pernicis* Timberlake, 1951. N. Y. Ent. Soc., Jour. 59: 58. ♂.

**platti** Timberlake. South. Calif. Pollen: Unknown, but visits flowers of *Lantana montevidensis*, *Salix*, *Salvia mellifera*.

*Anthophora platti* Timberlake, 1951. N. Y. Ent. Soc., Jour. 59: 60. ♂, ♀.

**porterae** Cockerell. Wyo., Colo., N. Mex., Calif. (desert). Pollen: Polylectic, visits flowers of *Astragalus* including *A. crotalariae*, *A. fremontii*, *Lupinus*, *Oenothera deltoides*, *Ribes*.  
*Anthophora porterae* Cockerell, 1900. Ann. and Mag. Nat. Hist. (7) 5: 407. ♂, ♀.  
*Anthophora porterae* var. *semiflava* Cockerell, 1905. Biol. Soc. Wash., Proc. 18: 183. ♂.  
*Anthophora porterae* var. *watsoni* Cockerell 1911. Amer. Ent. Soc., Trans. 37: 238. ♂.  
*Anthophora porterae* mut. *Thalassiana* Cockerell, 1920. Nature 105: 518. ♂.

**raui** Rohwer. Mo., Colo. to N. Y.

*Anthophora raui* Rohwer, 1923. Ent. Soc. Wash., Proc. 25: 100. ♀.

Biology: Rau, 1926. Acad. Sci. St. Louis, Trans. 25: 179. —Rau, 1929. Psyche 36: 555.

**smithii** Cresson. S. Dak., Kans., Colo., Tex., N. Mex., Ariz. Pollen: Unknown, but visits flowers of *Carduus*, *Cleome serrulata*, *Cnicus*, *Grindelia subalpina*, *Petalostemon oligophyllus*, *Salvia pitcheri*, *Verbena macdougalii*.

*Anthophora smithii* Cresson, 1869. Amer. Ent. Soc., Trans. 2: 289. ♂, ♀.

*Podalirius cardui* Cockerell, 1897. Amer. Ent. Soc., Trans. 24: 155. ♂.

Biology: Banks, 1902. N. Y. Ent. Soc., Jour. 10: 212. — Linsley, 1962. Ent. Soc. Amer., Ann. 55: 161-162, fig. 9.

*subignava* Cockerell. Colo.

*Anthophora subignava* Cockerell, 1929. N. Y. Ent. Soc., Jour. 37: 443. ♀.

*urbana catalinae* Cockerell. Calif. (Santa Catalina Isl.).

*Anthophora catalinae* Cockerell, 1901. Canad. Ent. 33: 297. ♀.

*urbana clementina* Cockerell. Calif. (San Clemente Isl.).

*Anthophora catalinae clementina* Cockerell, 1939. Calif. Acad. Sci., Proc. (4) 23: 430. ♀, ♂.

*urbana nicolai* Cockerell. Calif. (San Nicolas Isl.).

*Anthophora nicolai* Cockerell, 1939. Calif. Acad. Sci., Proc. (4) 23: 429. ♀, ♂.

*urbana urbana* Cresson. Idaho, Wash., Colo., Utah, N. Mex., Ariz., Calif.; Mexico (Baja

California and Sonora). Parasite: *Meloe niger* Kirby, *Xeromelecta californica* (Cress.), *Zodion obliquefasciatum* (Macq.)? Pollen: Highly polylectic, taking pollen and/or nectar from a great variety of annuals and perennials including *Allium*, *Amsinckia intermedia*, *Amorpha californica*, *Arctostaphylos drupacea*, *A. glandulosa*, *A. glauca*, *A. nevadensis*, *Artemisia tridentata*, *Asclepias eriocarpa*, *A. subulata*, *Aster canescens*, *Astragalus parishii*, *Baileya*, *Bebbia juncea*, *Brassica campestris*, *B. geniculata*, *Brodiaea crocea*, *B. laxa*, *B. lutea*, *Cakile edentula*, *Calycadenia multiglandulosa*, *Camissonia*, *Centaurea solstitialis*, *Cercidium floridum*, *Chaenactis artemisiaefolia*, *C. glabriuscula*, *Chaenactis foliolosa*, *Chamaenarion angustifolium*, *Chilopsis linearis*, *Chrysopsis fastigiata*, *C. villosa*, *Chrysothamnus nauseosus*, *Cirsium californicum*, *Clarkia biloba*, *C. cylindrica*, *C. rhomboidea*, *C. unguiculata*, *Clematis lasiantha*, *Cleome obtusifolia*, *Convolvulus arvensis*, *C. occidentalis*, *Cordylanthus nevini*, *Corethrogyne*, *Cryptantha intermedia*, *Dalea californica*, *D. emoryi*, *D. saundersii*, *Durantia plumieri*, *Epilobium*, *Eriastrum densiflorum*, *E. sapphirinum*, *E. virgatum*, *Erigeron divergens*, *E. stenophyllus*, *Eriodictyon californicum*, *E. parryi*, *E. trichocalyx*, *Eriogonum confertiflorum*, *E. fasciculatum*, *E. nodosum*, *E. nudum*, *E. subscapum*, *Eryngium aristatum*, *Geraea canescens*, *Gilia capitata*, *G. tricolor*, *Gormania obtusata*, *Grindelia camporum*, *Gutierrezia californica*, *G. lucida*, *G. sarothrae*, *Haplopappus acradenioides*, *H. linearifolius*, *H. palmeri*, *H. squarrosus*, *H. vernonioides*, *Helianthus annuus*, *H. gracilentus*, *Heliotropium curassavicum*, *Hemizonia paniculata*, *H. pungens*, *H. wheeleri*, *Hoffmanseggia*, *Horkelia bernardina*, *Hyptis emoryi*, *Iris*, *Lantana montividentis*, *Larrea tridentata*, *Lathyrus splendens*, *Lepidospartum squamatum*, *Lessingia germanorum*, *Lonicera japonica*, *Lotus argophyllus*, *L. davidsonii*, *L. hamatus*, *L. leucophaeus*, *L. purshianus*, *L. scoparius*, *Lupinus lobbii*, *L. superbus*, *Lythrum californicum*, *Malacothamnus densiflorus*, *Marrubium vulgare*, *Medicago sativa*, *Melilotus alba*, *Mentzelia multiflora*, *Mimulus guttatus*, *Mirabilis laevis*, *Monardella lanceolata*, *M. linoides*, *M. odoratissima*, *M. stricta*, *M. villosa*, *Navaretia*, *Oenothera*, *Palaforia linearis*, *Penstemon antirrhinoides*, *P. grinnellii*, *P. heterophyllus*, *P. heterodoxus*, *P. palmeri*, *P. spectabilis*, *Pentachaeta aurea*, *Phacelia cicutaria*, *P. ciliata*, *P. distans*, *P. frigida*, *P. imbricata*, *P. ramosissima*, *Phyllodoce breweri*, *Potentilla glandulosa*, *Prosopis glandulosa*, *Ranunculus californicus*, *Raphanus sativus*, *Rhus laurina*, *Rosa californica*, *Salazaria mexicana*, *Salvia apiana*, *S. carduacea*, *S. carnosa*, *S. clevelandii*, *S. mellifera*, *S. pachyphylla*, *S. pilosa*, *Scrophularia californica*, *Senecio douglasii*, *S. integerrimus*, *Sisymbrium*, *Solanum douglasii*, *Solidago californica*, *S. multiradiata*, *S. occidentalis*, *Stachys bullata*, *S. californica*, *Stephanomeria exigua*, *S. pauciflora*, *S. virgata*, *Streptanthus tortuosus*, *Trichostema lanceolatum*, *T. laxum*, *T. parishii*, *Verbena californica*, *Vicia americana*, *Wislizenia refracta*, *Zauschneria californica*. Predator: *Trogoderma incisum* LeC., *T. sternale* Jayne.

*Anthophora urbana* Cresson, 1878. Acad. Nat. Sci., Phila., Proc. 30: 188. ♀, ♂.

*Podalirius alamosanus* Cockerell, 1896. Canad. Ent. 28: 195. ♀.

Taxonomy: Michener, 1953. Kans. Univ. Sci. Bul. 35: 1080, figs. 223, 224, 226 (larva).

Biology: Davidson, 1897. South. Calif. Acad. Sci., Proc. 1: 4 (as *montana*). — Linsley, 1962.

Ent. Soc. Amer., Ann. 55: 161, fig. 9 (sleep). — Mayer and Johansen, 1976. Pan-Pacific Ent.

52: 120-125 (nest site, nest architecture, adult activity, development of life stages, parasites, predators, associates).



**ursina californiensis** Michener. Calif.

*Anthophora simillima* var. *californiensis* Michener, 1935. Pan-Pacific Ent. 11: 182. ♂, ♀.

**ursina simillima** Cresson. Wash., Wyo., Colo., N. Mex., Ariz., Calif. Pollen: Unknown, but visits flowers of *Astragalus*.

*Anthophora simillima* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 189. ♂.

*Anthophora euops* Cockerell, 1903. Ann. and Mag. Nat. Hist. (7) 12: 451. ♂.

Taxonomy: Patton, 1879. U. S. Geol. and Geog. Survey, Bul. 5: 478. ♂, ♀.

Biology: Hicks, 1926. Colo. Univ., Studies 15: 225.

**ursina ursina** Cresson. Wis. and Ill. east to New England, south to Ga., ?N. Mex. Parasite:

*Melecta pacifica atlantica* Linsley? Pollen: Unknown, but visits flowers of *Aesculus*, *Asclepias*, *Astragalus*, *Azalea*, *Cercis*, *Collinsia*, *Delphinium*, *Dicentra*, *Dodacatheon*, *Geranium*, *Lithospermum*, *Lonicera*, *Mertensia*, *Monarda*, *Pedicularis*, *Penstemon*, *Phlox*, *Physalis*, *Polygonatum*, *Polymonium*, *Ribes*, *Scutellaria*, *Trifolium*, *Vaccinium*, *Vicia*, *Viola*.

*Anthophora ursina* Cresson, 1869. Amer. Ent. Soc., Trans. 2: 291. ♂.

*Anthophora pyralitarsis* Dours, 1869. Soc. Linn. Nord France, Mem. 2: 160. ♂.

Taxonomy: Robertson, 1905. Amer. Ent. Soc., Trans. 31: 372. ♀, ♂. —Timberlake, 1951. N. Y. Ent. Soc., Jour. 59: 57.

**vallorum** (Cockerell). N. Mex.; Mexico. Parasite: *Hornia neomexicana* (Ckll.). Pollen:

Unknown, but visits flowers of *Chilopsis*, *Ipomoea*, *Proboscidea*, *Solanum elaeagnifolium*.

*Podalirius vallorum* Cockerell, 1896. Canad. Ent. 28: 195. ♂, ♀.

**vannigera** Timberlake. Calif., Ariz. Pollen: Unknown, but visits flowers of *Isomeris arborea*, *Lycium fremontii*, *L. torreyi*, *Phacelia distans*, *Salvia pilosa*.

*Anthophora vannigera* Timberlake, 1951. N. Y. Ent. Soc., Jour. 59: 56. ♂.

**walshii** Cresson. Mass., Wis., Ill., Iowa, Nebr., Mo., Kans., Colo., Tex., ?Ariz. Pollen: Unknown, but visits flowers of *Abutilon*, *Baptisia*, *Blephilia*, *Cassia*, *Chamaecrista*, *Cirsium*, *Helianthus*, *Lеспедеза*, *Lobelia*, *Petalostemon*, *Ruellia*, *Teucrium*.

*Anthophora walshii* Cresson, 1869. Amer. Ent. Soc., Trans. 2: 290. ♂, ♀.

#### Genus ANTHOPHORA Subgenus CLISODON Patton

*Clisodon* Patton, 1879. U. S. Geol. and Geog. Survey, Bul. 5: 479.

Type-species: *Anthophora furcata terminalis* Cresson. Monotypic and orig. desig. (= *Anthophora terminalis* Cresson).

*Anthophora furcata furcata* (Panzer) and other subspecies not listed here are Palearctic.

Taxonomy: Cockerell, 1936. Canad. Ent. 68: 276 (key). —Timberlake, 1951. N. Y. Ent. Soc., Jour. 59: 51 (status).

**furcata neofurcata** (Sladen). B. C.

*Clisodon neofurcata* Sladen, 1919. Canad. Ent. 51: 125. ♂, ♀.

**furcata pernigra** Cresson. Nev., Calif.

*Anthophora pernigra* Cresson, 1879. Amer. Ent. Soc., Trans. 7: 210. ♀.

**furcata sperryi** (Cockerell). Ariz.

*Clisodon terminalis sperryi* Cockerell, 1937. South. Calif. Acad. Sci., Bul. 36: 107. ♂.

**furcata syringae** (Cockerell). Wash., Calif. Pollen: Unknown, but visits flowers of *Castilleja*, *Solidago*, *Syringa*.

*Podalirius syringae* Cockerell, 1898. Acad. Nat. Sci. Phila., Proc. 50: 54. ♂.

Taxonomy: Cockerell, 1924. Pan-Pacific Ent. 1: 50. —Michener, 1953. Kans. Univ. Sci. Bul. 35: 1082, figs. 229-231 (larva).

**furcata terminalis** Cresson. Alta. and ?B. C. to Que., south to Colo., Utah, N. Mex., Ariz., Ill.

and N. C. Pollen: Unknown, but visits flowers of *Allium*, *Blephilia*, *Linum lewisii*, *Medicago*, *Mertensia*, *Monarda*, *Penstemon*, *Polemonium*, *Poutederia cordata*, *Prunella*, *Rosa*, *Salvia*, *Scutellaria*, *Stachys palustris*.

*Anthophora terminalis* Cresson, 1869. Amer. Ent. Soc., Trans. 2: 292. ♀, ♂.

*Ceratina bidentata* Provancher, 1882. Nat. Canad. 13: 234. ♂.

*Anthophora nudata* Provancher, 1888. Addit. Corr. Faune Ent. Canada, Hym., p. 336. ♂.

*Anthophora subglobulosa* Provancher, 1888. Addit. Corr. Faune Ent. Canada, Hym., v. 2, p. 297. ♂.

*Anthophora nubiterrae* Viereck, 1903. Amer. Ent. Soc., Trans. 29: 45. ♂.

Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 328-330, figs. 91, 92, table 10 (redescription, synonymy).

Biology: Cockerell, 1903. Birds and Nature, v. 14, p. 127. — Medler, 1964. Canad. Ent. 96: 1332-1336, 4 figs.

### Genus ANTHOPHORA Subgenus MICRANTHOPHORA Cockerell

*Anthophora* subg. *Micranthophora* Cockerell, 1906. Amer. Ent. Soc., Trans. 32: 66.

Type-species: *Anthophora curta* Provancher. Orig. desig.

*abroniae* Timberlake. Ariz., Calif.; Mexico. Pollen: Unknown, but visits flowers of *Abronia* including *A. villosa*, *Chaenactis fremontii*, *C. glabriuscula*, *Geraea canescens*, *Heliotropium curassavicum*.

*Anthophora abroniae* Timberlake, 1937. Amer. Mus. Novitates 958: 6. ♂, ♀.

*albata* Cresson. Kans., Colo.

*Anthophora albata* Cresson, 1876. Davenport Acad. Sci., Proc. 1: 211. ♀.

*arthuri* Cockerell. Colo. Parasite: *Zacosmia maculata* (Cress.).

*Anthophora arthuri* Cockerell, 1906. Amer. Ent. Soc., Trans. 32: 72. ♀.

*cockerelli* Timberlake. Calif., deserts. Pollen: Unknown, but visits flowers of *Cleomella obtusifolia*, *Dalea*, *Heliotropium curassavicum*, *Wislizenia refracta*.

*Anthophora cockerelli* Timberlake, 1937. Amer. Mus. Novitates 958: 4. ♂, ♀.

*columbariae* Timberlake and Cockerell. Calif. Pollen: Unknown, but visits flowers of *Chaenactis fremontii*, *C. glabriuscula*, *Cryptantha intermedia*, *Lotus scoparius*, *Lupinus nanus*, *Phacelia minor*, *Salvia carduacea*, *S. columbariae*, *Salvia mellifera*, *Sphaeralcea ambigua*, *Trifolium variegatum*.

*Anthophora (Micranthophora) columbariae* Timberlake and Cockerell, 1937. In Cockerell, Amer. Mus. Novitates 948: 9. ♂, ♀.

*curta curta* Provancher. Calif.; Mexico (Baja California). Parasite: *Zacosmia maculata* (Cress.). Pollen: Polylectic, visits a wide variety of flowers including *Abronia villosa*, *Acacia greggii*, *Baileya pleniradiata*, *Bebbia juncea*, *Calycadenia tenella*, *Centaurea melitensis*, *C. solstitialis*, *Chaenactis artemisiaefolia*, *C. fremontii*, *C. glabriuscula*, *C. tenuifolia*, *Chrysopsis villosa*, *Chrysanthemum nauseosus*, *Chrysanthemum coronaria*, *Cnicus*, *Convolvulus arvensis*, *Coreopsis lanceolata*, *Corethrogyne bernardina*, *Croton californicus*, *Cryptantha intermedia*, *C. lepida*, *Curcubita foetidissima*, *Encelia actoni*, *E. californica*, *E. farinosa*, *Eriodictyon trichocalyx*, *Eriogonum fasciculatum*, *Eriophyllum multicaule*, *Grindelia camporum*, *G. elata*, *Gutierrezia californica*, *G. lucida*, *G. sarothrae*, *Haplopappus palmeri*, *Helianthus annuus*, *H. gracilentus*, *Heliotropium curassavicum*, *Hemizonia fasciculata*, *H. paniculata*, *H. pungens*, *H. wrightii*, *Heterotheca grandiflora*, *Jaumea carnosa*, *Layia platyglossa*, *Lotus scoparius*, *Melilotus alba*, *Palafoxia linearis*, *Pentachaeta aurea*, *Peucephyllum schottii*, *Phacelia distans*, *Phylla nodiflora rosea*, *Raphanus sativus*, *Salvia columbariae*, *Senecio californica*, *S. douglasii*, *Stephanomeria exigua*, *S. virgata*, *Trichostema lanceolatum*, *T. parishii*, *Viguiera laciniata*, *V. multiflora*.

*Anthophora curta* Provancher, 1895. Nat. Canad. 22: 173. ♀.

*Anthophora curta* var. *ensenadensis* Cockerell, 1941. San Diego Soc. Nat. Hist., Trans. 9: 349. ♂.

Taxonomy: Cockerell, 1907. Ent. News 18: 396. ♂.

*curta melanops* Cockerell. Colo., Tex., N. Mex., Ariz.; Mexico. Parasite: *Zacosmia maculata* (Cress.). Pollen: Unknown, but visits flowers of *Cleome*, *Dithyrea wislizeni*, *Pectis papposa*, *Wedelia incarnata*.

*Anthophora curta* var. *melanops* Cockerell, 1926. Pan-Pacific Ent. 3: 84. ♂.

Biology: Hicks, 1934. Colo. Univ., Studies 21: 265 (nest, parasite).

**erythrothorax** Michener. Calif.

*Anthophora erythrothorax* Michener, 1936. Brooklyn Ent. Soc., Bul. 31: 93. ♀.

**estebana** Cockerell. South. Calif. deserts; Mexico (Baja California). Pollen: Unknown, but visits flowers of *Bebbia juncea*, *Chaenactis fremontii*, *Dalea*, *Encelia farinosa*, *Hyptis emoryi*, *Peucephyllum schottii*.

*Anthophora estebana* Cockerell, 1923. Calif. Acad. Sci., Proc. (4) 12: 81. ♂.

**exigua** Cresson. N. Mex., Nev., Calif. Pollen: Unknown, but visits flowers of *Chaenactis fremontii*, *Chrysothamnus nauseosus speciosus*, *C. viscidiflorus*, *Haplopappus linearifolius*, *H. monactis*, *Lessingia*, *Penstemon*, *Senecio douglasii*.

*Anthophora exigua* Cresson, 1879. Amer. Ent. Soc., Trans. 7: 211. ♀, ♂.

**flavocincta** Huard. Calif. Pollen: Unknown, but visits flowers of *Artemisia*, *Cressa cretica*, *Heliotropium curassavicum*, *Hemizonia paniculata*.

*Anthophora nigrocincta* Provancher, 1895. Nat. Canad. 22: 172. ♂. Preocc.

*Anthophora flavocincta* Huard, 1897. Nat. Canad. 24: 25. N. name.

*Anthophora anstrutheri* Cockerell, 1906. Amer. Ent. Soc., Trans. 32: 71. ♀.

**flexipes** Cresson. Utah, Colo., Nev., Calif. Parasite: *Anthrax limatulus* Marst., *Zacosmia maculata* (Cress.), *Zonitis* (*Neozonitis*) *hesperis* Selander. Pollen: Polylectic, stores pollen from a wide variety of flowers.

*Anthophora flexipes* Cresson, 1879. Amer. Ent. Soc., Trans. 7: 211. ♀, ♂.

Biology: Torchio and Youssef, 1968. Kans. Ent. Soc., Jour. 41: 289-302, 21 figs. (life history).

**hololeuca** Cockerell. Ariz., South. Calif.; Mexico (Baja California and Sonora). Pollen: Polylectic, most commonly taken at flowers of *Dalea*, *Acacia* and *Cercidium*, but visits other flowers including *Abronia*, *Acamptopappus*, *Bebbia*, *Croton*, *Cryptantha*, *Heliotropium*, *Koeberlinia*, *Larrea*, *Oenothera*, *Palafoxia*, *Stephanomeria*.

*Anthophora hololeuca* Cockerell, 1923. Calif. Acad. Sci., Proc. (4) 12: 82. ♀, ♂.

**maculifrons** Cresson. N. Mex., Nev., Calif.; Mexico (Baja California). Pollen: Unknown, but visits flowers of *Chrysothamnus* including *C. nauseosus*, *C. viscidiflorus*, *Helianthus annuus*.

*Anthophora maculifrons* Cresson, 1879. Amer. Ent. Soc., Trans. 7: 210. ♀, ♂.

**mortuaria** Timberlake. Calif. Pollen: Unknown, but visits flowers of *Heliotropium curassavicum*, *Pluchea sericea*.

*Anthophora mortuaria* Timberlake, 1937. Amer. Mus. Novitates 958: 10. ♂, ♀.

**nigritula** Cockerell. Calif.

*Anthophora nigritula* Cockerell, 1924. Pan-Pacific Ent. 1: 52. ♀.

Taxonomy: Michener, 1936. Brooklyn Ent. Soc., Bul. 31: 93. ♂.

**pachyodonta** Cockerell. Nev., South. Calif.; Mexico (Baja California), deserts. Pollen: Unknown, but visits flowers of *Bebbia juncea*, *Encelia farinosa*, *Heliotropium curassavicum*, *Sphaeralcea emoryi*, *S. orcutti*.

*Anthophora pachyodonta* Cockerell, 1923. Calif. Acad. Sci., Proc. (4) 12: 80. ♂.

**peritomae** Cockerell. Wyo., Utah, Colo., N. Mex. Parasite: *Anthrax limatulus artemisia* Marst., *Zacosmia maculata* (Cress.). Pollen: Stores pollen from flowers of *Grindelia squarrosa*, but visits other flowers including *Chrysopsis*, *Chrysothamnus*, *Helianthus annuus*, *Solidago canadensis*.

*Anthophora curta* var. *peritomae* Cockerell, 1905. Ent. News 16: 272. ♂.

*Anthophora peritomae* var. *interspersa* Cockerell, 1907. Ent. News 18: 397. ♂.

*Anthophora peritomae* var. *tinctula* Cockerell, 1907. Ent. News 18: 397. ♀.

Taxonomy: Cockerell, 1907. Ent. News 18: 396. ♂, ♀.

Biology: Torchio, 1971. Los Angeles Co. Mus., Contrib., Sci. 206: 1-14, 13 figs. (life history).

**petrophila** Cockerell. N. Mex., Calif. Pollen: Unknown, but visits flowers of *Acamptopappus sphaerocephalus*, *Amsinckia intermedia*, *A. tessellata*, *Aster canescens*, *Astragalus*, *Baileya pleniradiata*, *Bebbia juncea*, *Chaenactis brachypappa*, *C. carphoclinia*, *C. glabriuscula*, *Chrysothamnus nauseosus*, *Dalea saundersii*, *Erigeron foliosus*, *Eriophyllum confertiflorum*, *Geraea canescens*, *Gutierrezia lucida*, *Haplopappus acradenius*, *H. cooperi*, *H. linearifolius*, *H. monactis*, *Lessingia tenuis*, *Lotus davidsonii*,

*L. scoparius*, *Monardella exilis*, *Salvia pilosa*, *Stephanomeria exigua*, *S. pauciflora* S. virgata.

*Anthophora curta petrophila* Cockerell, 1905. South. Calif. Acad. Sci., Bul. 4: 15. ♀.

Taxonomy: Cockerell, 1907. Ent. News 18: 395. ♂.

**phenax** (Cockerell). Tex. to South. Calif., Mexico. Pollen: Unknown, but visits flowers of *Lycium* including *L. torreyi*.

*Podalirius phenax* Cockerell, 1898. Canad. Ent. 30: 146. ♂.

**rhodothorax** Michener. Calif. Pollen: Unknown, but visits flowers of *Chrysopsis villosa*, *Erigeron*, *Lessingia glandulifera*, *Monardella stricta*.

*Anthophora rhodothorax* Michener, 1936. Brooklyn Ent. Soc., Bul. 31: 94. ♀, ♂.

*Anthophora emarginata* Timberlake, 1937. Amer. Mus. Novitates 958: 11. ♂, ♀.

**salazariae** Timberlake. Calif., deserts. Pollen: Unknown, but visits flowers of *Baileya*, *Bebbia juncea*, *Chaenactis carphoclinia*, *C. fremontii*, *Dalea saundersii*, *Erodium cicutarium*, *Haplopappus cooperi*, *Larrea tridentata*, *Lotus scoparius*, *Oenothera clavaeformis*, *O. desertorum*, *Phacelia distans*, *Palafoxia linearis*, *Salazaria mexicana*, *Salvia columbariae*, *Senecio longilobus*.

*Anthophora salazariae* Timberlake, 1937. Amer. Mus. Novitates 958: 7. ♀, ♂.

### Genus EMPHOROPSIS Ashmead

*Emphoropsis* Ashmead, 1899. Amer. Ent. Soc., Trans. 26: 60.

Type-species: *Habropoda floridana* Smith. Desig. by Cockerell and Cockerell, 1901.

*Meliturgeopsis* Ashmead, 1899. Amer. Ent. Soc., Trans. 26: 62.

Type-species: *Emphoropsis murina* Cockerell. First included species, Cockerell, 1909. (= *Emphoropsis murihirta murina* Cockerell).

*Psithyrus* subg. *Laboriopsithyrus* Frison, 1927. Amer. Ent. Soc., Trans. 53: 69.

Type-species: *Bombus laboriosus* Fabricius. Orig. desig.

Taxonomy: Cockerell, 1905. South. Calif. Acad. Sci., Bul. 4: 99-100.

**birkmanni** Cockerell. Tex.

*Emphoropsis birkmanni* Cockerell, 1905. Canad. Ent. 37: 265. ♀.

Taxonomy: Cockerell, 1934. Amer. Mus. Novitates 732: 2. ♀, ♂.

Biology: Cockerell, 1934. Amer. Mus. Novitates 732: 2 (nest).

**cineraria** (Smith). B. C., Wash., Calif. Parasite: *Melecta thoracica* (Sm.), *M. pacifica* Cress.

Pollen: Unknown, but visits flowers of *Arctostaphylos mariposa*, *A. patula*, *Ribes*.

*Anthophora cineraria* Smith, 1879. Descr. New Species Hym. Brit. Mus., p. 124. ♀, ♂.

Taxonomy: Cockerell, 1904. Canad. Ent. 36: 302.

Biology: Torchio and Youssef, 1968. Kans. Ent. Soc., Jour. 41: 300 (parasite).

**citula** Cockerell. Colo.

*Emphoropsis citulus* Cockerell, 1929. N. Y. Ent. Soc., Jour. 37: 442. ♂.

**cressoni** (Dalla Torre). Wyo., Colo. ?B. C. Pollen: Unknown, but visits flowers of *Delphinium*, *Ribes longiflorum*.

*Anthophora mucida* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. 30: 191. ♀. Preocc.

*Podalirius cressoni* Dalla Torre, 1896. Cat. Hym., v. 10, p. 264. N. name.

*Emphoropsis mucida* var. *johnseni* Cockerell, 1905. Entomologist 38: 59. ♀, ♂.

*Emphoropsis mucida* var. *ventralis* Michener, 1936. Amer. Mus. Novitates 876: 3. ♀.

Taxonomy: Cockerell, 1907. Colo. Univ., Studies 4: 256. ♂. — Michener, 1936. Amer. Mus.

Novitates 876: 3. ♀, ♂.

**dammersi** Timberlake. Calif. Pollen: Unknown, but visits flowers of *Arctostaphylos* including *A. glauca*, *A. pungens*.

*Emphoropsis dammersi* Timberlake, 1937. Amer. Mus. Novitates 958: 2. ♀, ♂.

**depressa** (Fowler). Calif. Pollen: Unknown, but visits flowers of *Amsinckia intermedia*, *Arbutus menziesii*, *Arctostaphylos glauca*, *Berberis californica*, *Brassica*, *Ceanothus*

*soredatus*, *Eriodictyon californicum*, *Lupinus albifrons*, *Phacelia*, *Ribes indecorum*, *Salvia columbariae*, *S. mellifera*, *S. sonomensis*, *Vicia*.

*Habropoda depressa* Fowler, 1899. *Canad. Ent.* 31: 283. ♀, ♂.

Biology: Fowler, 1899. *Canad. Ent.* 31: 283 (nest, adult habits).

**excellens** Timberlake. Calif. (Kern Co.). Pollen: Unknown, but visits flowers of *Chrysothamnus*.

*Emphoropsis excellens* Timberlake, 1962. *Ent. News* 73: 36. ♀, ♂.

**interspersa** Cockerell. Calif. Pollen: Unknown, but visits flowers of *Amsinckia douglasiana*, *A. intermedia*, *Astragalus*, *Salvia mellifera*.

*Emphoropsis interspersa* Cockerell, 1905. *South. Calif. Acad. Sci., Bul.* 4: 99. ♂.

Taxonomy: Cockerell, 1924. *Pan-Pacific Ent.* 1: 50.

**laboriosa fedorensis** Cockerell. Tex.

*Emphoropsis floridana* var. *fedorensis* Cockerell, 1905. *Canad. Ent.* 37: 265. ♂, ♀.

**laboriosa laboriosa** (Fabricius). Ill. to New England, south to Miss. and Fla. Pollen: Unknown, but visits flowers of *Cercis*, *Cirsium*, *Dicentra*, *Gelsemium sempervirens*, *Lupinus*, *Malus*, *Melilotus*, *Prunus*, *Vaccinium*, *Vicia*.

*Bombus laboriosus* Fabricius, 1804. *Systema Piezatorum*, p. 352.

*Anthophora floridana* Smith, 1854. *Cat. Hym. Brit. Mus.*, v. 2, p. 339. ♀, ♂.

Taxonomy: Mitchell, 1962. *N. C. Agr. Expt. Sta. Tech. Bul.* 152: 332-333, fig. 95 (redescription, synonymy).

Biology: Ornduff, 1970. *Arnold Arboretum, Jour.* 51: 1-17 (floral visitation).

**miserabilis** (Cresson). Wash., Oreg. Calif.; Mexico (Baja Calif.). Pollen: Stores pollen of *Abronia*, *Convolvulus*, *Lupinus*, but visits flowers of *Arctostaphylos*, *Cirsium*, *Erysimum*, *Lantana*, *Lotus*, *Lupinus*, *Phacelia*, *Raphanus* for nectar.

*Anthophora miserabilis* Cresson, 1878. *Acad. Nat. Sci. Phila., Proc.* 30: 191. ♂.

Taxonomy: Torchio and Stephen, 1961. *Ent. Soc. Amer., Ann.* 54: 683-687, 7 figs. (larva and pupa).

Biology: Stephen and Torchio, 1961. *Ent. Soc. Amer., Ann.* 54: 687-692, 2 figs. (nest, life history).

**morrisoni** (Cresson). Colo.

*Anthophora morrisoni* Cresson, 1878. *Acad. Nat. Sci. Phila., Proc.* 30: 192. ♂.

**murihirta** Cockerell. B. C., Calif.

*Emphoropsis murihirta* Cockerell, 1905. *Ent. News* 16: 81. ♂.

**murina** Cockerell. Calif.

*Emphoropsis murihirta murina* Cockerell, 1909. *U. S. Natl. Mus., Proc.* 36: 414. ♂.

Taxonomy: Cockerell, 1924. *Pan-Pacific Ent.* 1: 49. ♂, ♀.

**pallida** Timberlake. South. Calif., Ariz., Utah, deserts. Parasite: *Lytta magister* Horn, *Zonitis* (*Neozonitis*) n. sp. Pollen: Apparently an oligolege of *Larrea tridentata*, but visits flowers of other plants including *Compositae*, *Lupinus*, *Camissonia*, *Phacelia crenulata* for nectar and sometimes for pollen.

*Emphoropsis pallida* Timberlake, 1937. *Amer. Mus. Novitates* 958: 1. ♀, ♂.

Biology: Bohart, Torchio, Maeta and Rust, 1972. *Kans. Ent. Soc., Jour.* 45: 381-392, 14 figs. (life history). —Hurd and Linsley, 1975. *Smithsn. Contrib. Zool.* 193: 44 (pollen relationships).

**pascoensis** (Cockerell). Wash.

*Habropoda floridana* var. *pascoensis* Cockerell, 1898. *Acad. Nat. Sci. Phila., Proc.* 50: 54. ♀.

**rugosissima** Cockerell. Calif., Nev.; Mexico (Baja California). Pollen: Collects pollen from flowers of *Camissonia clavaeformis*, *C. kernensis*, but also visits flowers of *Abronia maritima*, *Amsinckia intermedia*, *Lupinus bicolor*, *L. nanus*, *Lotus scoparius*, *Phacelia distans*, *Salvia mellifera*, *Stanleya pinnata*.

*Emphoropsis rugosissima* Cockerell, 1905. *Biol. Soc. Wash., Proc.* 18: 182. ♀.

- Biology: Linsley, MacSwain and Raven, 1963. Calif. Univ. Pubs. Ent. 33: 46 (floral relationships).  
*salviae* Michener. Calif. Pollen: Unknown, but visits flowers of *Salvia*.  
*Emphoropsis salviae* Michener, 1936. Brooklyn Ent. Soc., Bul. 31: 95. ♂.  
*salvium* (Cockerell). N. Mex., Ariz. Pollen: Unknown, but visits flowers of *Salvia*.  
*Habropoda salvium* Cockerell, 1898. N. Mex. Agr. Expt. Sta., Bul. 24: 42. ♂, ♀.  
*semifulva* Cockerell. Calif.  
*Emphoropsis semifulva* Cockerell, 1905. South. Calif. Acad. Sci., Bul. 4: 99. ♂.  
*tristissima* Cockerell. Calif. Pollen: Unknown, but visits flowers of *Amsinckia intermedia*,  
*Arctostaphylos patula*, *Collinsia bicolor*, *Lupinus bicolor*, *L. nanus*, *Phacelia distans*,  
*Salvia sonomensis*.  
*Emphoropsis infernalis tristissima* Cockerell, 1904. South. Calif. Acad. Sci., Bul. 3: 161. ♀.  
*vierecki* Cockerell. Colo., N. Mex.  
*Emphoropsis vierecki* Cockerell, 1909. U. S. Natl. Mus., Proc. 36: 414. ♀.

### TRIBE MELECTINI

All the members of this tribe are cleptoparasites in the nests of other anthophorid bees. The Melectini occur on all the continents except Australia.

Revision: Linsley, 1939. Ent. Soc. Amer., Ann. 32: 429-468, 9 figs. (Nearctic spp.). — Hurd and Linsley, 1951. Calif. Ins. Survey, Bul. 1: 119-140, 1 pl., 5 maps (U. S. spp.). — Lieftinck, 1972. Tijdschr. Ent. 115: 253-324, 57 figs., 2 pls., 2 maps, 1 table (generic revision of smaller genera of Old World melectines, distribution and host relationships, comments on N. Amer. genera).

Taxonomy: Hurd, 1953. Kans. Ent. Soc., Jour. 26: 35-37, 1 map (generic distribution in Americas). — Rozen, 1969. Amer. Mus. Novitates 2382: 1-24, 56 figs. (larva).

### Genus MELECTA Latreille

#### Genus MELECTA Subgenus MELECTA Latreille

*Melecta* Latreille, 1802. Hist. Nat. Fourmis, p. 427.

Type-species: *Apis albifrons* Forster. Desig. by Latreille, 1810 (= *Apis punctata* Fabricius), see Day and Fitton, 1977. Biol. Jour. Linn. Soc. 9: 40.

*Symmorpha* Klug, 1807. Mag. f. Insektenk. 6: 198, 227.

Type-species: *Apis albifrons* Forster. Monotypic (= *Apis punctata* Fabricius).

*Bombomelecta* Patton, 1879. U. S. Geol. and Geog. Survey, Bul., p. 370.

Type-species: *Melecta thoracica* Cresson. Monotypic.

*bohartorum* Linsley. Calif., Nev.

*Melecta (Melecta) bohartorum* Linsley, 1939. Ent. Soc. Amer., Ann. 32: 442. ♀.

*pacifica atlantica* Linsley. Kans. and Nebr., to N. J., south to Ga. and Ala. Host: *Anthophora ursina* *ursina* Cress.?

*Melecta (Melecta) atlantica* Linsley, 1943. N. Y. Ent. Soc., Jour. 51: 225. ♀.

Taxonomy: Michener, 1948. Ent. Soc. Wash., Proc. 50: 17. ♀, ♂. — Michener, 1954. Kans. Ent. Soc., Jour. 27: 66. — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 492-493, fig. 117 (redescription).

*pacifica fulvida* Cresson. Wash., Oreg. northeast. Calif., Idaho, Wyo., Colo., Utah, Nev., Ariz., N. Mex., Tex. Host: *Anthophora pacifica infernalis* (Dalla Torre), *Emphoropsis cineraria* Smith.

*Melecta fulvida* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 204. ♀.

*Bombomelecta semifulva* Cockerell, 1921. Ann. and Mag. Nat. Hist. (9) 7: 212. ♂.

Taxonomy: Michener, 1948. Ent. Soc. Wash., Proc. 50: 17. ♂. — Hurd and Linsley, 1951. Calif. Ins. Survey, Bul. 1: 128, map 4.

Biology: Torchio and Youssef, 1968. Kans. Ent. Soc., Jour. 41: 30 (induced parasitization; as *M. pacifica*).

**pacifica pacifica** Cresson. Calif.

*Melecta pacifica* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 91. ♂.

Taxonomy: Hurd and Linsley, 1951. Calif. Ins. Survey, Bul. 1: 127, map 4.

**separata alfredi** (Cockerell). N. Mex.

*Bombomelecta alfredi* Cockerell, 1895. Psyche 7 (sup.): 11. ♂.

**separata arizonica** (Cockerell). Ariz. Host: *Anthophora forbesii* Kkll.

*Bombomelecta arizonica* Cockerell, 1902. Canad. Ent. 34: 267. ♀.

Biology: Lutz and Cockerell, 1920. Amer. Mus. Nat. Hist., Bul. 42: 574 (host).

**separata callura** (Cockerell). B. C., to Calif., Idaho, Utah, Colo., Ariz., N. Mex. Host:

*Anthophora edwardsii* Cress. Parasite: *Sphaerophthalma unicolor* (Cress.).

*Bombomelecta callura* Cockerell, 1926. Pan-Pacific Ent. 3: 58. ♂.

Taxonomy: Rozen, 1969. Amer. Mus. Novitates 2382: 8-10, figs. 2-8 (larva).

Biology: Thorp, 1969. Amer. Midland Nat. 82: 330-331 (host). —Thorp, 1969. Amer. Midland Nat. 82: 338-345, 7 figs. (behavior, ecology).

**separata johnsoni** (Cockerell). Colo.

*Bombomelecta johnsoni* Cockerell, 1905. Ent. News 16: 270. ♂.

**separata mojaviensis** Linsley. Calif. (Mojave Desert).

*Melecta (Melecta) separata mojaviensis* Linsley, 1939. Ent. Soc. Amer., Ann. 32: 446. ♀, ♂.

**separata separata** Cresson. Calif., Oreg., Wash., Idaho.

*Melecta separata* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 204. ♀.

**thoracica** Cresson. Wash., Oreg., Calif. (Sierra Nevada Mts.), Nev., Utah, Colo., Wyo., Nebr., S. Dak., Kans. Host: *Emphoropsis cineraria* (Sm.).

*Melecta thoracica* Cresson, 1875. Rpt. Geog. Geol. Expl. and Survey west of 100th Meridian, v. 5, p. 726.

*Melecta (Melecta) sierrae* Linsley, 1939. Ent. Soc. Amer., Ann. 32: 437. ♀, ♂.

Taxonomy: Linsley, 1945. Ent. News 56: 151, fig. 1. ♀. —Hurd and Linsley, 1951. Calif. Ins. Survey, Bul. 1: 126, map. 2.

Biology: Linsley, 1943. Pan-Pacific Ent. 19: 160 (habits, as *M. sierrae*).

#### Genus MELECTA Subgenus MELECTOMIMUS Linsley

*Melecta* subg. *Melectomimus* Linsley, 1939. Ent. Soc. Amer., Ann. 32: 448.

Type-species: *Melecta edwardsii* Cresson. Monotypic and orig. desig.

**edwardsii** Cresson. Calif., Nev.; Mexico (Baja California). Host: ?*Emphoropsis* sp.

*Melecta edwardsii* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 92. ♂.

*Bombomelecta zygos* Viereck, 1903. Amer. Ent. Soc., Trans. 29: 179. ♀.

#### Genus XEROMELECTA Linsley

Another subgenus, *Nesomelecta*, is found in the West Indies.

#### Genus XEROMELECTA Subgenus XEROMELECTA Linsley

*Melecta* subg. *Xeromelecta* Linsley, 1939. Ent. Soc. Amer., Ann. 32: 450.

Type-species: *Bombomelecta larreae* Cockerell. Monotypic and orig. desig.

**larreae** (Cockerell). N. Mex. to Nev., south. Calif.

*Bombomelecta larreae* Cockerell, 1900. Canad. Ent. 32: 361. ♀.

*Bombomelecta azygos* Viereck, 1903. Amer. Ent. Soc., Trans. 29: 181. ♂.

#### Genus XEROMELECTA Subgenus MELECTOMORPHA Linsley

*Melecta* subg. *Melectomorpha* Linsley, 1939. Ent. Soc. Amer., Ann. 32: 451.

Type-species: *Melecta californica* Cresson. Orig. desig.

**californica** (Cresson). B. C. to Calif. east to Ill., Mo., Okla., Tex.; Mexico (Baja California,

Puebla and Zacatecas). Host: *Anthophora abrupta* Say, *A. bomboideus neomexicana* Kkll.,

*A. bomboides stanfordiana* Ckll., *A. edwardsii* Cress., *A. linsleyi* Timb., *A. occidentalis* Cress., *A. urbana* Cress. Parasite: *Sphaerophthalma anthophora* (Ashm.), *S. unicolor* (Cress.).

*Melecta californica* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 91. ♂, ♀.

*Melecta miranda* Fox, 1893. Ent. News 4: 143. ♀.

*Pseudomelecta pasadenensis* Cockerell, 1910. Ann. and Mag. Nat. Hist. (8) 5: 27. ♀.

*Melecta sladeni* Viereck, 1924. Canad. Ent. 56: 15. ♀.

Taxonomy: Hurd and Linsley, 1951. Calif. Ins. Survey, Bul. 1: 128, map 5. — Hurd, 1953.

Kans. Ent. Soc., Jour. 26: 35-36 (Mexican distrib.). — Michener, 1953. Kans. Univ. Sci. Bul. 35: 1083, figs. 238-242 (larva). — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 494-496, fig. 119 (redescript.). — Rozen, 1969. Amer. Mus. Novitates 2382: 10.

Biology: Hicks, 1926. Colo. Univ., Studies 15: 224 (as *californica miranda*). — Mickel, 1928.

Ent. News 39: 73 (as *californica miranda*). — Linsley and MacSwain, 1942. Amer. Midland Nat. 27: 408, f. 10. — Hobbs, Nummi and Virotek, 1961. Canad. Ent. 93: 146. — Linsley, 1962. Ent. Soc. Amer., Ann. 55: 162-163, fig. 8.

**interrupta** (Cresson). Minn., Wis., and Ill., south to Tex., west to Wyo., Colo. and Ariz.; Mexico (Chihuahua, Durango and Zacatecas). Host: *Anthophora abrupta* Say.

*Melecta interrupta* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 275. ♀, ♂.

*Melecta interrupta* var. *fallugiae* Cockerell, 1904. Ann. and Mag. Nat. Hist. (7) 14: 23. ♀.

*Melecta interrupta* var. *rociadensis* Cockerell, 1904. Ann. and Mag. Nat. Hist. (7) 14: 23. ♂.

Taxonomy: Hurd and Linsley, 1951. Calif. Ins. Survey, Bul. 1: 133, map 5. — Hurd, 1953.

Kans. Ent. Soc., Jour. 26: 36 (Mexican distrib.). — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 496-497, fig. 119 (redescription).

### Genus BRACHYMELECTA Linsley

*Brachymelecta* Linsley, 1939. Ent. Soc. Amer., Ann. 32: 458.

Type-species: *Melecta? mucida* Cresson. Monotypic and orig. desig.

**mucida** (Cresson). Nev.

*Melecta? mucida* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 205. ♂.

### Genus ZACOSMIA Ashmead

*Zacosmia* Ashmead, 1898. Psyche 8: 282.

Type-species: *Melecta maculata* Cresson. Monotypic and orig. desig.

*Micromelecta* Baker, 1906. Invertebrata Pacifica, v. 1, p. 143.

Type-species: *Melecta maculata* Cresson. Monotypic and orig. desig.

**maculata desertorum** Cockerell. North. Mexico to south. Calif., Ariz., Tex.

*Zacosmia maculata desertorum* Cockerell, 1916. Canad. Ent. 48: 391. ♂.

**maculata maculata** (Cresson). Alta. and Wash. to Calif., Idaho, Utah, Colo. and Wyo. Host:

*Anthophora (Micranthophora) arthuri* Ckll., *A. (M.) curta melanops* Ckll., *A. (M.)*

*flexipes* Cress., *A. (M.) peritomae* Ckll. Parasite: *Anthrax limatulus larrea* Marston.

*Melecta maculata* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 204. ♀, ♂.

*Melecta (Pseudomelecta?) suffusa* Viereck, 1924. Canad. Ent. 56: 15. ♀. N. syn.

Taxonomy: Hurd and Linsley, 1951. Calif. Ins. Survey, Bul. 1: 122. — Hurd, 1953. Kans. Ent. Soc., Jour. 26: 37, fig. (Mexican distrib.). — Rozen, 1969. Amer. Mus. Novitates 2382: 14-15, figs. 24-30 (larva).

Biology: Hicks, 1934. Colo. Univ., Studies 21 (4): 265-267. — Torchio and Youssef, 1968. Kans. Ent. Soc., Jour. 41: 289-302, 21 figs. (ecology, immature stages). — Torchio, 1971. Los Angeles Co. Mus., Contrib. Sci. 206: 1-10, 13 figs., 1 table (ecology).

### TRIBE CENTRIDINI

This is a New World group of pollen-collecting bees which are especially abundant in the tropics although some species are present in the warm temperate regions of both continents. The tribe contains two genera, *Centris* and *Epicharis*, but only the genus *Centris* occurs in America north of Mexico.



Taxonomy: Rozen, 1965. Amer. Mus. Novitates 2233: 13-26, figs. 35-72 (larvae).

### Genus CENTRIS Fabricius

Taxonomy: Timberlake, 1940. Pan-Pacific Ent. 16: 138-141 (Calif. spp.). — Michener, 1951. Kans. Ent. Soc., Jour. 24: 1-11 (subgenera). — Snelling, 1956. Pan-Pacific Ent. 32: 1-8 (Calif. spp.). — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 333-338, figs. 96, 97 (eastern U. S. spp.). — Snelling, 1966. Los Angeles Co. Mus., Contrib. Sci. 112: 1-33 (nomencl. and tax. of some N. Amer. spp.). — Snelling, 1974. Los Angeles Co. Mus., Contrib. Sci. 259: 1-41, 44 figs. (distr. and tax. of some N. Amer. spp.).

Biology: Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 44-46 (intrafloral ecol. of *Larrea* visiting spp.). — Alcock, Jones and Buchmann, 1976. Kans. Ent. Soc., Jour. 49: 469-474, 5 figs., 1 table (nesting behavior).

### Genus CENTRIS Subgenus XEROCENTRIS Snelling

*Centris* subg. *Xerocentris* Snelling, 1974. Los Angeles Co. Mus., Contrib. Sci. 259: 3.

Type-species: *Centris californica* Timberlake. Orig. desig.

Taxonomy: Snelling, 1974. Los Angeles Co. Mus., Contrib. Sci. 259: 3-5 (key to N. Amer. spp.).

**californica** Timberlake. Calif., Ariz.; Mexico (Baja California). Pollen: Apparently oligolectic on *Wislizenia refracta*, but also visits flowers of *Cleomella obtusifolia*.

*Centris californica* Timberlake, 1940. Pan-Pacific Ent. 16: 139. ♀.

**hoffmanseggiae** Cockerell. N. Mex., Ariz., south Calif. and Santa Lucia Mts. in coastal central Calif. Pollen: Polylectic, visits flowers of *Astragalus*, *Cercidium*, *Dicentra chrysantha*, *Larrea tridentata*, *Lotus scoparius*, *Lupinus densiflorus*, *Medicago sativa*, *Melilotus*, *Penstemon antirrhinoides*, *Prosopis glandulosa*.

*Centris hoffmanseggiae* Cockerell, 1897. Ann. and Mag. Nat. Hist. (6) 19: 395. ♂ (♀ misdet.).

*Centris hoffmanseggiae davidsoni* Cockerell, 1904. South. Calif. Acad. Sci., Bul. 3: 160. ♂.

Taxonomy: Cockerell, 1900. Canad. Ent. 32: 363. ♂, ♀.

**pallida** Fox. Ariz., south Calif. deserts and Santa Catalina Island; Mexico (Baja California and Sonora). Pollen: Polylectic, chiefly *Acacia greggii*, *Cercidium torreyanum*, *Dalea emoryi*, *D. spinosa*, *Larrea tridentata*, *Olnya tesota*, *Prosopis pubescens*, but also visits other flowers including *Asclepias erosa*, *Aster spinosa*, *Cirsium*, *Parkinsonia aculeata*.

*Centris pallida* Fox, 1899. Acad. Nat. Sci. Phila., Proc. 51: 66. ♀.

*Centris pallida callognatha* Cockerell, 1923. Calif. Acad. Sci., Proc. (4) 12: 78. ♀.

*Centris trichosoma* Cockerell, 1923. Calif. Acad. Sci., Proc. (4) 12: 78. ♂.

Biology: Alcock, Jones and Buchmann, 1976. Jour. Zool., London 179: 189-199, 3 pls., 2 figs., 2 tables (nest site, adult behavior including emergence, mating). — Alcock, Jones and Buchmann, 1976. Kans. Ent. Soc., Jour. 49: 472-474, figs. 4, 5, table 1 (nest architecture, nesting behavior). — Alcock, 1976. Psyche 83: 121-131, 2 figs., 1 table (social organization of male populations).

**rhodomelas** Timberlake. Calif. Pollen: Unknown, but visits flowers of *Psoralea macrostachya*.

*Centris rhodomelas* Timberlake, 1940. Pan-Pacific Ent. 16: 139. ♀, ♂.

**tiburoneensis** Cockerell. Ariz., south Calif.; Mexico (Baja California). Pollen: Polylectic, chiefly *Dalea* including *D. emoryi*, *D. schottii*, *D. spinosa*, but visits other flowers for nectar and/or pollen including *Acacia greggii*, *Asclepias*, *Cercidium torreyanum*, *Koeberlinia spinosa*, *Olnya tesota*.

*Centris tiburoneensis* Cockerell, 1923. Calif. Acad. Sci., Proc. (4) 12: 78. ♀.

### Genus CENTRIS Subgenus PARACENTRIS Cameron

*Paracentris* Cameron, 1903. Amer. Ent. Soc., Trans. 29: 235.

Type-species: *Paracentris fulvohirta* Cameron. Monotypic.

*Centris* subg. *Penthemisia* Moure, 1950. Dusenla 1: 390.

Type-species: *Hemisia Chilensis* Spinola. Orig. desig.

*Centris* subg. *Trichocentris* Snelling, 1956. Pan-Pacific Ent. 32: 4.

Type-species: *Centris rhodoleuca* Cockerell. Orig. desig.

Taxonomy: Snelling, 1974. Los Angeles Co. Mus., Contrib. Sci. 259: 5-20, figs. (key to N. Amer. spp.).

**angustifrons** Snelling. Ariz. (Huachuca Mts.).

*Centris (Paracentris) angustifrons* Snelling, 1966. Los Angeles Co. Mus., Contrib. Sci. 112: 13. ♀.

**aterrima** Smith. South. Ariz.; Mexico.

*Centris aterrima* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 378. ♂.

**atripes** Mocsary. Tex., N. Mex., Ariz., Calif. (Brawley); Mexico to Costa Rica. Pollen: Polylectic, visits flowers of *Dalea*, *Hyptis*, *Kallstroemia grandiflora*, *Koeberlinia spinosa*, *Larrea tridentata*, *Solanum elaeagnifolium*.

*Centris atripes* Mocsary, 1899. Termes. Fuzetek 22: 254. ♂.

*Centris atriventris* Fox, 1899. Acad. Nat. Sci. Phila., Proc. 51: 68. ♀, ♂. Preocc.

*Centris fori* Friese, 1900. K. K. Naturhist. Hofmus., Ann. 15: 350. N. name.

**caesalpiniae** Cockerell. Tex., N. Mex., Ariz.; Mexico (Chihuahua). Pollen: Polylectic, visits flowers of *Acacia*, *Asclepias brachystephana*, *Baccharis*, *Cevallia sinuata*, *Eriogonum*, *Hoffmanseggia densiflora*, *H. falcaria*, *Robinia*, *Solanum elaeagnifolium*, *S. rostratum*, *Verbesina encelioides*.

*Centris caesalpiniae* Cockerell, 1897. Ann. and Mag. Nat. Hist. (6) 19: 394. ♀, ♂.

*Centris morsei* Cockerell, 1897. Acad. Nat. Sci. Phila., Proc. 49: 355. ♂.

*Centris marginata* Fox, 1899. Acad. Nat. Sci. Phila., Proc. 51: 67. ♂.

**cockerelli cockerelli** Fox. Tex., N. Mex.; Mexico (Chihuahua, Nuevo Leon, Tamaulipas); intergrades with following subspecies in western N. Mex., Chihuahua, eastern Ariz. and Sonora. Pollen: Presumably polylectic, visits flowers of *Dalea formosa*, *Hoffmanseggia*, *Prosopis glandulosa* var. *torreyanum*.

*Centris Cockerelli* Fox, 1899. Acad. Nat. Sci. Phila., Proc. 51: 68. ♀.

**cockerelli resoluta** Cockerell. Ariz., Nev., south. Calif.; Mexico (Baja California and Sonora).

Pollen: Polylectic, chiefly *Cercidium torreyanum*, *Dalea*, *Krameria*, *Larrea tridentata*, *Prosopis*, but visits other flowers for nectar and possibly pollen.

*Centris cockerelli resoluta* Cockerell, 1923. Calif. Acad. Sci., Proc. (4) 12: 76. ♀, ♂.

Biology: Alcock, Jones and Buchmann, 1976. Kans. Ent. Soc., Jour. 49: 471-472, fig. 3, table 1 (nest architecture, nesting behavior).

**lanosa** Cresson. Kans., Tex., and western Fla.

*Centris lanosa* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 284. ♂.

*Centris subhyalina* Fox, 1899. Acad. Nat. Sci. Phila., Proc. 51: 69. ♀.

*Centris birkmannii* Friese, 1900. Termes. Fuzetek 23: 44. ♂, ♀.

**mexicana** Smith. Ariz., N. Mex., Tex.; Mexico (Chihuahua, D. F., Durango, Michoacan, Nuevo Leon, and Sonora). Pollen: Unknown, but visits flowers of *Cevallia sinuata*, *Hoffmanseggia densiflora*, *Melilotus alba*, *Menodora scabra*.

*Centris mexicana* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 378. "♀" = ♂.

**rhodopus** Cockerell. Tex., N. Mex., Ariz., south. Calif.; Mexico (Baja California, Chihuahua, and Sonora). Pollen: Polylectic, visits flowers of a wide variety of plants including *Acacia greggii*, *Asclepias*, *Bebbia juncea*, *Centaurea*, *Cercidium torreyanum*, *Cevallia sinuata*, *Chilopsis linearis*, *Croton californicus*, *Dalea schottii*, *D. spinosa*, *Eriogonum inflatum*, *Eriodictyon*, *Eriophyllum*, *Hoffmanseggia densiflora*, *H. falcaria*, *Larrea tridentata*, *Lupinus*, *Palafoxia linearis*, *Prosopis glandulosa*, *Solanum elaeagnifolium*, *S. rostratum*, *Solidago confinis*, *Tamarix*, *Wislizenia refracta*.

*Centris caesalpiniae* var. *rhodopus* Cockerell, 1897. Ann. and Mag. Nat. Hist. (6) 19: 394. ♀, ♂.

*Centris rhodopus* var. *pulchrior* Cockerell, 1900. Canad. Ent. 32: 363. ♂.

*Centris rhodoleuca* Cockerell, 1923. Calif. Acad. Sci., Proc. (4) 12: 75. ♂.

Biology: Alcock, Jones and Buchmann, 1976. Kans. Ent. Soc., Jour. 49: 469-471, figs. 1, 2, table 1 (nest architecture, nesting behavior).

- zacateca** Snelling. Ariz., N. Mex.; Mexico (Chihuahua, Durango, Jalisco and Zacatecas). Pollen: Unknown, but visits flowers of *Baccharis*, *Hoffmanseggia densiflora*, *Melilotus alba*, *Penstemon tenuifolius*.  
*Centris* (*Paracentris*) *zacateca* Snelling, 1966. Los Angeles Co. Mus., Contrib. Sci. 112: 11. ♀, ♂.

#### Genus CENTRIS Subgenus ACRITOCENTRIS Snelling

- Centris* subg. *Acritocentris* Snelling, 1974. Los Angeles Co. Mus., Contrib. Sci. 259: 36.  
 Type-species: *Centris* (*Melanocentris*) *ruthannae* Snelling. Orig. desig.  
**ruthannae** Snelling. Ariz. Pollen: Unknown, but visits flowers of *Kallstroemia grandiflora*.  
*Centris* (*Melanocentris*) *ruthannae* Snelling, 1966. Los Angeles Co. Mus., Contrib. Sci. 112: 28, fig. 1d and i. ♂, ♀.

#### Genus CENTRIS Subgenus CENTRIS Fabricius

- Centris* Fabricius, 1804. Systema Piezatorum, p. 354. Name placed on Official List of Generic Names in Zool. by Internatl. Comn. Zool. Nomencl., Op. 567, 1959.  
 Type-species: *Apis haemorrhoidalis* Fabricius. Desig. by Internatl. Comn. Zool. Nomencl., Op. 567, 1959.  
*Hemisia* Klug, 1807. Mag. Insektenk. 6: 227.  
 Type-species: *Apis haemorrhoidalis* Fabricius. Desig. by Cockerell, 1906.  
**decolorata** Lepeletier. Tex. (Cameron Co.); Mexico.  
*Centris decolorata* Lepeletier, 1841. Hist. Nat. Ins., Hym. v. 2, p. 160. ♂.  
**eiseni** Fox. Ariz.; Mexico (Baja California, Morelos, Puebla, Sinaloa, and Sonora).  
*Centris eiseni* Fox, 1894. Calif. Acad. Sci., Proc. 4: 22. ♀.  
**flavofasciata** Friese. Ariz. (Nogales); Mexico (Guerrero, Morelos and Sonora), south to Panama.  
*Centris flavifrons* var. *flavofasciata* Friese, 1899. Termesz. Fuzetek 23: 46. ♂.  
**versicolor** (Fabricius). South. Fla.; widespread in American tropics. Pollen: Polylectic, visits flowers of *Borrchia*, *Byrsonima*, *Carymbola*, *Erigenia*, *Ocimum*, *Securidaca* and *Thryallis* in the United States.  
*Apis versicolor* Fabricius, 1775. Systema Ent., p. 386.  
*Centris versicolor vincentana* Cockerell, 1938. Entomologist 71: 282. ♀.  
 Taxonomy: Moure, 1960. Studia Ent. 3: 123-125 (synonymy).

#### Genus CENTRIS Subgenus HEMISIELLA Moure

- Hemisiella* Moure, 1945. Rev. de Ent. 16: 407.  
 Type-species: *Apis lanipes* Fabricius. Orig. desig.  
**confinis** Perez. Ariz. (Patagonia and Tumacacori); Mexico (Chiapas, Guanajuato, Morelos, Puebla). Pollen: Presumably polylectic, is known to collect pollen from flowers of *Parkinsonia aculeata*, but also visits these and other flowers for nectar including *Eysenhardtia polystacha*, *Jacaranda*.  
*Centris confinis* Perez, 1905. Mus. Hist. Nat. Paris, Bul. 11: 40. ♀.  
**transversa** Perez. Ariz. (Superior); Mexico (Puebla and Tehuacan). Pollen: Unknown, but Arizona specimen was taken at flowers of tamarisk.  
*Centris transversa* Perez, 1905. Mus. Hist. Nat. Paris, Bul. 11: 39. ♀, ♂.

#### Genus CENTRIS Subgenus UNASSIGNED

- limbata** Friese. Tex.  
*Centris limbata* Friese, 1900. Termes. Fuzetek 23: 44. ♀.

#### TRIBE CTENIOSCHELINI

This is a chiefly Neotropical group of parasitic bees and only the genera *Ericrocis* and *Mesoplia* extend northward into the United States.

Taxonomy: Rozen, 1969. Amer. Mus. Novitates 2382: 1-24, 56 figs. (larva).

Genus **ERICROCIS** Cresson

*Ericrocis* Cresson, 1887. Amer. Ent. Soc., Trans. Sup. Vol., pp. 131, 134.

Type-species: *Crocisa? lata* Cresson. Monotypic.

Revision: Linsley, 1939. Ent. Soc. Amer., Ann. 32: 463-468.

**arizonensis** Baker. South. Calif., Ariz.; Mexico. Host: *Anthophora* spp., *Centris* spp.

*Ericrocis arizonensis* Baker, 1906. Invertebrata Pacifica, v. 1, p. 143. ♂.

*Ericrocis melectoides* Baker, 1906. Invertebrata Pacifica, v. 1, p. 144. ♀ (♂ misdet.).

**lata** (Cresson). Fla. to south. Calif.

*Crocisa? lata* Cresson, 1878. Amer. Ent. Soc., Trans. 7: 91. ♂.

Genus **MESOPLIA** Lepeletier

*Mesoplia* Lepeletier, 1841. Hist. Nat. Ins., Hym., v. 2, p. 457.

Type-species: *Mesocheira azurea* Lepeletier and Serville. Monotypic.

*Melissa* Smith, 1854. Cat. Hym. Brit. Mus. 2: 279.

Type-species: *Mesocheira azurea* Lepeletier and Serville. Desig. by Sandhouse, 1943.

**dugesi** (Cockerell). South. Ariz.; Mexico.

*Mesonychium dugesi* Cockerell, 1917. Ann. and Mag. Nat. Hist. (8) 19: 477. ♂.

## SUBFAMILY XYLOCOPINAE

Although these bees are found throughout much of the world they are especially well represented by numerous species in the tropics. Most of the species are pollen-collecting bees and, unlike most other non-parasitic anthophorids, they usually make their nests in wood of various sorts. The subfamily contains two tribes, the Ceratinini (small carpenter bees) and the Xylocopini (large carpenter bees) both of which are present in America north of Mexico.

## TRIBE CERATININI

This is a large group of mostly small, almost hairless bees which, except for parasitic species, make their nests in hollow, pithy or rotten stems and sometimes in vines. While there are about a dozen genera of these bees present in the Old World including the cleptoparasitic *Eucondylops*, *Inquilina* and *Nasutapis*, only the nearly worldwide genus *Ceratina* and the endemic Chilean genus *Manuelia* are present in the New World.

*Pithitis smaragdula* (Fabr.) was intentionally introduced into the United States from Ludhiana, India on April 10, 1969 at Davis, California as a potentially important pollinator of economically useful plants, especially legumes and cucurbits (Daly, Bohart and Thorp, 1971. Ent. Soc. Amer., Ann. 64: 1145-1150). The introduction apparently was unsuccessful since no recoveries of this species have been reported.

Genus **CERATINA** Latreille

Revision: Daly, 1973. Calif. Univ. Pubs. Ent. 74: 1-113, 31 figs. 2 pls., 3 tables (U. S. spp.).

Taxonomy: Smith, 1907. Amer. Ent. Soc., Trans. 33: 115-124 (N. Amer. spp.). — Sandhouse, 1935. Ent. Soc. Wash., Proc. 37: 93-95 (east. U. S. species). — Michener, 1936. Amer. Mus. Novitates 844: 1-13 (west. U. S. spp.). — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 500-507, figs. 121-125. — Hirashima, 1971. Faculty Agr., Kyushu Univ., Jour. 16: 349-375, 20 figs. (subgeneric classification).

Biology: Malyshev, 1912. Trav. Soc. Imper. Nat. St. Petersburg, Compt. Rend. Seances 43: 252-5, 276-7 (natural enemies). — Daly, 1967. Ent. Soc. Amer., Ann. 60: 1273-1282, 7 figs., 1 table (natural enemies).

Genus **CERATINA** Subgenus **CERATINA** Latreille

*Clavicera* Latreille, 1802. Hist. Nat. Fourmis, p. 433. Name suppressed by Internatl. Comm. Zool. Nomencl., Op. 1001, 1973.

*Ceratina* Latreille, 1802. Hist. Nat. Crust. Ins., v. 3, p. 380. Name placed on Official List of Generic Names in Zool. by Internatl. Comm. Zool. Nomencl., Op. 1001, 1973.

Type-species: *Apis cucurbitina* Rossi. Monotypic. (= *Hylaenus albilabris* Fabricius).  
*Neoceratina* Perkins, 1912. Ann. and Mag. Nat. Hist. (8) 9: 117.

Type-species: *Neoceratina australensis* Perkins. Monotypic.  
*Ceratina* Moure, 1941. Arq. Mus. Paranaense 1: 78.

Type-species: *Ceratina lucidula* Smith. Orig. desig.

Taxonomy: Michener, 1965. Amer. Mus. Nat. Hist., Bul. 130: 220-221 (synonymy).

**arizonensis** Cockerell. Tex. to Calif.; Mexico; inadvertently and successfully introduced into the Hawaiian Islands (Oahu). Pollen: Polylectic, visits a wide variety of flowers including *Antirrhinum nuttallianum*, *Asclepias*, *Baccharis sarothroides*, *Baeria chrysostoma*, *Brassica*, *Calochortus venustus*, *Ceanothus crassifolius*, *Chaenactis*, *Chorizanthe parryi*, *Cirsium*, *Clarkia*, *Cleomella obtusifolia*, *Condalia*, *Cressa*, *Croton californicus*, *Cryptantha flaccida*, *C. intermedia*, *C. muricata*, *Encelia farinosa*, *Ericameria parishii*, *Eriogonum fasciculatum*, *E. f. var. foliolosum*, *E. gracile*, *Eriophyllum confertiflorum*, *E. lanosum*, *Euphorbia albomarginata*, *E. palmeri*, *E. pediculifera*, *Larrea tridentata*, *Lotus glaber*, *Lycium fremontii*, *Malacothrix californica*, *Mesembryanthemum*, *Nolina microcarpa*, *Phacelia distans*, *P. douglasii*, *Prosopis juliflora*, *Rhus*, *Salix lasiolepis*, *Salvia mellifera*, *Senecio californicus*, *Solanum elaeagnifolium*, *Sphaeralcea laxa*, *Tamarix gallica*.

*Ceratina arizonensis* Cockerell, 1898. Canad. Ent. 30: 238. ♂.

*Ceratina arizonensis vanduzeei* Cockerell, 1924. Calif. Acad. Sci. (4) 12: 543. ♀.

**cockerelli** Smith. S. C., Ga. and Fla., west to Tex. Pollen: Apparently polylectic, visits a wide variety of flowers including *Agastache breviflora*, *Bidens*, *Callirhoe involucrata*, *Citrullus vulgaris*, *Erigeron quercifolius*, *Euphorbia*, *Gaillardia*, *Heterotheca*, *Lippia*, *Lupinus*, *Marilaunidium origanifolium*, *Melilotus alba*, *Monarda citridora*, *Phacelia patuliflora*, *Polygala*, *Rubus*, *Sabatia campestris*, *Sida heterophylla*, *Stachys floridana*.  
*Ceratina lunata* Smith, 1907. Amer. Ent. Soc., Trans. 33: 119. ♂, ♀. Preocc.  
*Ceratina cockerelli* Smith, 1907. Canad. Ent. 39: 260. N. name.

#### Genus CERATINA Subgenus ZADONTOMERUS Ashmead

*Zadontomerus* Ashmead, 1899. Amer. Ent. Soc., Trans. 26: 69.

Type-species: *Ceratina tejonensis* Cresson. Monotypic and orig. desig.

*Zadontomerus* Cockerell and Porter, 1899. Ann. and Mag. Nat. Hist. (7) 4: 406. Emend.

#### SPECIES GROUP DUPLA

**calcarata** Robertson. Que. to Ga., west to Man., south to Tex. Ecology: Nests in borings in sumac pith. Parasite: *Aprostocetus americanus* Ashm., *Axima zabriskiei* Howard, *Coelopencyrtus hylaei* Burks, *Grotea anguina* Cress., *Omalus iridescens* (Nort.)?, *Parasierola* sp., *Rhydinofoenus tarsatorius* (Say). Pollen: Polylectic, visits a wide variety of flowers including *Aesculus glabra sargentii*, *Alliaria officinalis*, *Amelanchier canadensis arborea*, *Amorpha fruticosa*, *Amphiachyris dracunculoides*, *Antennaria*, *Apocynum*, *Arabis*, *Aruncus*, *Aster azureus*, *A. laevis*, *A. macrophyllus*, *A. paniculatus*, *A. sagittifolius*, *Barbarea vulgaris*, *Bicuculla cucullaria*, *Blephilia*, *Brassica*, *Cacalia*, *Callirhoe digitata*, *Caltha palustris*, *Camassia*, *Capsella bursa-pastoris*, *Cardamine*, *Ceanothus ovatus*, *Celastrus scandens*, *Cercis*, *Chionanthus virginicus*, *Chrysanthemum leucanthemum*, *Chrysopsis*, *Cirsium*, *Claytonia caroliniana virginica*, *Collinsia*, *Convolvulus sepium*, *Crataegus*, *Cypripedium*, *Dentaria diphylla*, *Deutzia gracilis*, *Dirca*, *Echium vulgare*, *Ellisia*, *Erigenia*, *Erigeron canadensis*, *E. philadelphicus*, *E. pulchellus*, *E. ramosus*, *Erythronium*, *Eulophus*, *Eupatorium ageratoides*, *Euphorbia marginata*, *Forsythia*, *Fragaria virginiana*, *Geranium maculatum*, *Gum*, *Gillenia grossularia*, *Haplopappus*, *Helianthus*, *Hepatica*, *Heterotheca*, *Hydrangea paniculata*, *Ilex*, *Inula helenium*, *Isopyrum*, *Kolkwitzia amabilis*, *Lepargyrea canadensis*, *Lepidium*, *Lonicera siberica*, *L. tatarica*, *Maculara pomifera*, *Malus*, *Malva rotundifolia*, *Melilotus alba*, *M. officinalis*, *Osmorrhiza*, *Oxalis europaea*, *Polemonium*, *Potentilla recta*, *Prunus americana*, *P. gracilis*, *P. persica*, *P. serotina*, *P. tomentosa*, *Pulsatilla hirsutissima*, *Pyraecantha*, *Pyrus ioensis*, *Ranunculus*, *Rhus aromatica*, *R. canadensis*, *R. glabra*, *Ribes*

*missouriense*, *Robinia pseudacacia*, *Rubus*, *Rudbeckia*, *Salix discolor*, *S. nigra*, *Salvia*, *Sambucus*, *Sanguinaria*, *Scilla campanulata*, *Senecio aureus*, *Smilacina*, *Solidago canadensis*, *S. rigida*, *S. rupestris*, *Spiraea vanhouttei*, *Taenidia*, *Taraxacum officinale*, *T. taraxacum*, *Tussilago farfara*, *Vaccinium*, *Verbena*, *Viburnum molle*, *Viola papilionacea*, *Waldsteinia*, *Zanthoxylum*, *Zizia aurea*.

*Ceratina calcarata* Robertson, 1900. Acad. Sci. St. Louis, Trans. 10: 54. ♂.

Biology: Rau, 1926. Acad. Sci. St. Louis, Trans. 25: 184. — Rau, 1928. Ent. Soc. Amer., Ann. 21: 380 (nest, parasite). — Krombein, 1960. Ent. News 71: 68 (nest, parasite).

**dupla** Say. Que. to Fla., west to Man., south to Tex., La. and Miss. Parasite: *Aprostocetus americanus* Ashm., *Arisma zabriskiei* Howard, *Diormorus zabriskiei* Cress., *Grotea anguina* Cress., *Habritys latrus* Wallace, *Hoplocryptus gracilis* (Prov.), *Merisus* sp. Pollen: Polylectic, visits a wide variety of flowers including *Aesculus glabra sargentii*, *Amelanchier canadensis*, *Ammannia*, *Amorpha*, *Anemonella*, *Antennaria plantaginifolia*, *Anthemis cotula*, *Arctium*, *Arabis*, *Arunceus*, *Asclepias*, *Aster paniculatus*, *Barbarea vulgaris*, *Benzoin aestivale*, *Bidens mitis*, *B. pilosa*, *Blephilia*, *Brassica*, *Brauneria*, *Cacalia*, *Camassia*, *Capsella bursa-pastoris*, *Cardamine*, *Ceanothus*, *Cephalanthus occidentalis*, *Cerastium*, *Chrysanthemum leucanthemum*, *Chrysopsis*, *Circaea*, *Cirsium*, *Claytonia caroliniana*, *Collinsia*, *Convolvulus*, *Coreopsis*, *Cornus*, *Crataegus punctata*, *Cryptotaenia*, *Cypripedium*, *Daucus carota*, *Delphinium*, *Dentaria diphylla*, *D. laciniata*, *Dianthera*, *Diospyros*, *Dirca*, *Ellisia*, *Emilia coccinea*, *Erigenia*, *Erigeron annuus*, *E. canadensis*, *E. philadelphicus*, *E. quercifolius*, *Eryngium*, *Erythronium*, *Eupatorium*, *Flaveria linearis*, *Fragaria virginiana*, *Galactia*, *Geranium maculatum*, *Gerardia*, *Gillenia*, *Hedeoma*, *Helenium*, *Helianthus*, *Heliopsis*, *Heracleum*, *Houstonia*, *Hydrangea paniculata*, *Hydrophyllum*, *Hypoxis*, *Isopyrum*, *Krigia*, *Lactuca*, *Leonurus*, *Lepidium*, *Liatris*, *Lithospermum*, *Lobelia*, *Lycopus*, *Lythrum*, *Malus*, *Marrubium*, *Medicago lupulina*, *Melilotus alba*, *M. officinalis*, *Monarda*, *Nelumbo*, *Nepeta*, *Oenothera*, *Opuntia*, *Oxalis*, *Pastinaca*, *Penstemon*, *Petalostemon*, *Phacelia covillei*, *Phyrma*, *Poinciana*, *Polemonium*, *Polygonatum*, *Polygonum*, *Potentilla recta*, *Prunus americana*, *P. serotina*, *Prunella*, *Psoralea*, *Ptelea*, *Pulsatilla*, *Pycnanthemum*, *Ranunculus*, *Rhannus*, *Rhus*, *Rosa*, *Rubus*, *Rudbeckia*, *Sabatia*, *Sagittaria*, *Salix discolor*, *S. sericea*, *Salvia lyrata*, *S. pratensis*, *Sambucus*, *Scrophularia*, *Scutellaria*, *Senecio plattensis*, *Sida*, *Silphium*, *Sinapis*, *Smilax*, *Solidago*, *Specularia*, *Spiraea*, *Stachys floridana*, *Stellaria*, *Stokesia laevis*, *Taraxacum dens-leonis*, *T. officinale*, *Teucrium*, *Tradescantia*, *Trifolium*, *Triosteum*, *Tussilago farfara*, *Vaccinium corymbosum*, *Verbena*, *Verbesina*, *Vernonia*, *Veronica*, *Viburnum*, *Viola rafinesquii*, *Waldsteinia*, *Zizia aurea*. Predator: *Atomosia puella* (Wied.).

*Ceratina dupla* Say, 1837. Boston Jour. Nat. Hist. 1: 397. ♀ (♂ misdet.).

*Halictus ontariensis* Provancher, 1882. Nat. Canad. 13: 203. ♂.

*Ceratina dupla* var. *halophila* Cockerell, 1911. Canad. Ent. 43: 390. ♀.

*Ceratina dupla floridana* Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 505. ♂, ♀.

Taxonomy: Michener, 1953. Kans. Univ. Sci. Bul. 35: 1063, figs. 173-179 (larva).

Biology: Angus, 1869. Amer. Nat. 2: 49. — Ashmead, 1894. Psyche 7: 25. — Comstock and Comstock, 1895. Manual for Study of Insects, p. 669. — Packard, 1897. N. Y. Ent. Soc., Jour. 5: 112. — Graenicher, 1905. Ent. News 16: 43. — Graenicher, 1905. Wis. Nat. Hist. Soc., Bul. 3: 158. — Hicks, 1926. Colo. Univ., Studies 15: 250.

**strenua** Smith. N. Y. to Ga., west to Wis., Mo., Kans., Okla. and Tex. Parasite: *Arisma zabriskiei* Howard, *Grotea anguina* Cress. Pollen: Polylectic, visits a wide variety of flowers including *Amorpha fruticosa*, *Arctium minus*, *Asclepias tuberosa*, *Aster*, *Brauneria purpurea*, *Callirhoe digitata*, *Ceanothus ovatus*, *Cercis canadensis*, *Chrysanthemum*, *Chrysopsis*, *Claytonia virginica*, *Coreopsis grandiflora*, *Crataegus*, *Daucus carota*, *Erigeron philadelphicus*, *Euphorbia*, *Fragaria virginiana*, *Geranium maculatum*, *Helenium*, *Helianthus*, *Heterotheca*, *Hydrangea arborescens*, *Kolkwitzia amabilis*, *Leucanthemum*, *Marrubium vulgare*, *Melilotus albus*, *M. officinalis*, *Oenothera*, *Oxalis*, *Phacelia*, *Potentilla pumila*, *P. canadensis*, *Prunus*, *Psoralea floribunda*, *Ptelea trifoliata*, *Pyracantha*, *Rhus aromatica*, *R. canadensis*, *R. glabra*,

*Robinia pseudoacacia*, *Rubus nigrobaccus*, *Salix nigra*, *Senecio*, *Silphium laciniatum*, *Solidago*, *Taraxacum dens-leonis*, *Vaccinium*, *Verbena urticifolia*, *Vernonia baldwinii*, *Viola sororia*, *Vitez agnus-castus*, *Waldsteinia*, *Zizia aurea*.

*Ceratina strenua* Smith, 1879. Descr. New Species Hym. Brit. Mus., p. 97. ♂.

*Ceratina metallica* Smith, 1907. Amer. Ent. Soc., Trans. 33: 121. ♂.

Biology: Krombein, 1960. Ent. News 71: 68 (nest). —Gordh and Barrows, 1976. Kans. Ent. Soc., Jour. 49: 344-345, 1 fig. (phoresitized female, as *metallica*).

**texana** Daly. Tex. Pollen: Presumably polylectic, visits flowers of *Agastache breviflora*, *Callirhoe involucrata*, *Lippia*, *Monarda citriodora*, *Opuntia*, *Phacelia patuliflora*, *Rubus*.

*Ceratina texana* Daly, 1973. Calif. Univ. Pubs. Ent. 74: 100, figs. 9c, 13l, 26, 28i. ♀, ♂.

#### SPECIES GROUP NANULA

**apacheorum** Daly. N. Mex., Ariz., Calif. and Nev. Pollen: Apparently polylectic, visits a wide variety of flowers including *Acacia greggii*, *Aster*, *Baccharis glutinosa*, *B. sarothroides*, *Baileya multiradiata*, *Cassia leptocarpa*, *Cercidium floridum*, *Chaenactis stereoides*, *Chilopsis linearis*, *Condalia lycioides*, *Croton*, *Cryptantha intermedia*, *Encelia farinosa*, *Eriodictyon crassifolium*, *Gutierrezia lucida*, *Haplopappus cooperi*, *Heliotropium curassavicum*, *Heterotheca*, *Larrea tridentata*, *Medicago sativa*, *Melilotus*, *Mimosa biunciflora*, *Opuntia*, *Penstemon centranthifolius*, *P. parryi*, *Prosopis juliflora*, *Rhamnus crocea*, *Salix*, *Senecio monoensis*, *Sphaeralcea emoryi*, *S. laza*, *S. pedata*, *Tamarix gallica*, *Verbesina*, *Wislizenia refracta*.

*Ceratina apacheorum* Daly, 1973. Calif. Univ. Pubs. Ent. 74: 36, figs. 13i, 25, 28d, 30b. ♀, ♂.

Biology: Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 46 (floral ecology).

**hurdi** Daly. Calif. (Jamesburg and Pinnacles Natl. Mon.).

*Ceratina hurdi* Daly, 1973. Calif. Univ. Pubs. Ent. 74: 53, figs. 13d, 28c, 30a, 31c, 31i. ♀, ♂.

**nanula** Cockerell. B. C. to Calif., Idaho, Mont., south to Ariz. and N. Mex.; Mexico (northern). Parasite: *Aprostocetus americanus* Ashm., *Coelopezcyrtus hyleoleter* Burks?, *Eurytoma apiculata* Bugbee, *Grotea californica* Cress. Pollen: Polylectic, visits a wide variety of flowers including *Achillea borealis arenicola*, *Allium acuminatum*, *Aphyllon multiflorum*, *Aragallus lambertii*, *Arctostaphylos*, *Argemone platyceras*, *Asclepias fascicularis*, *A. tuberosa*, *Aster adscendens*, *Astragalus goniatus*, *Baccharis glutinosa*, *B. pilularis*, *B. sarothroides*, *Berberis*, *Besseyia plantaginea*, *Brassica*, *Calochortus lutea*, *C. paludicola*, *Camissonia clavaeformis*, *Ceanothus*, *Centarium davyi*, *Centaurea melitensis*, *Chrysopsis*, *Chrysothamnus nauseosus speciosus*, *C. viscidiflorus*, *C. v. typicus*, *Chorizanthe cuspidata*, *C. staticoides*, *Cirsium arvense*, *C. vulgare*, *Clarkia amoena huntiana*, *C. biloba*, *C. rubicunda*, *Cleome lutea*, *C. serrulata*, *Collinsia heterophylla*, *Convolvulus occidentalis*, *Corethrogyne virgata*, *Cowania stansburyana*, *Cryptantha intermedia*, *Dalea greggii*, *Descurainia sophia*, *Diplaucus auriantiacus*, *Encelia californica*, *E. farinosa*, *Epilobium*, *Erigeron argentatus*, *E. divergens*, *E. foliosus*, *E. inornatus*, *E. miser*, *E. stenophyllus*, *E. strigosus*, *Eriodictyon californicus*, *Eriogonum fasciculatum*, *E. heermannii*, *E. nudum*, *E. vimineum*, *Eriophyllum confertiflorum*, *Eschscholzia californica*, *Euphorbia albomarginata*, *Gilia altissima*, *G. exilis*, *Gnaphalium californicum*, *Grindelia camporum*, *G. latifolia*, *Helenium puerulorum*, *Helianthella californica*, *Helianthus petiolaris*, *Heliotropium curassavicum*, *Hesperochiron californicus*, *Heterotheca grandiflora*, *Hieracium albidiflorum*, *Hulsea callicarpa*, *Iris*, *Kerria japonica*, *Lasthenia chrysostoma*, *Lepechinia calycina*, *Linanthus aureus*, *Lomatium dissectum*, *Lotus nevadensis*, *L. scoparius*, *L. strigosus* var. *hirtellus*, *Lupinus arboreus*, *Malacothrix saxatilis*, *Melilotus alba*, *M. officinalis*, *Mentzelia laevicaulis*, *Mimulus guttatus*, *Monardella villosa*, *Montia perfoliata*, *Navarretia heterodoxa*, *Nemophila integrifolia*, *Oenothera ovata*, *Opuntia basalaris*, *Penstemon centranthifolius*, *P. floridus*, *P. grinnellii*, *Phacelia congesta*, *P. distans*, *P. fremontii*, *P. minor*, *P. ramosissima*, *Physaria*, *Plantago lanceolata*, *Plectritis ciliosa*, *Prunus subcordata*, *Ranunculus californicus*, *Rhamnus crocea*, *Salix*, *Salvia mellifera*, *Sapindus saponaria*, *Scrophularia californica*, *Senecio longilobus*, *Solidago*,

*Sphaeralcea ambigua*, *Stephanomeria cichoriacea*, *S. virgata*, *Thelypodium linearifolium*, *Trichostema*, *Trifolium microcephalum*, *Verbena lasiostachys*, *V. prostrata*, *Viola nuttallii*, *Wedelia incarnata*, *Wyethia*.  
*Ceratina nanula* Cockerell, 1897. Acad. Nat. Sci. Phila., Proc. 49: 352. ♂.  
*Ceratina nanula rigdenae* Michener, 1936. Amer. Mus. Novitates 844: 3. ♀, ♂.

Biology: Hicks, 1926. Colo. Univ., Studies 15: 251 (nest).

**shinnersi** Daly. Tex. Pollen: Apparently polylectic, visits flowers of *Amblyolepis setigera*, *Amphichayris*, *Argemone intermedia*, *A. mexicana*, *Aster exilis*, *Astragalus*, *Callirhoe involucrata*, *Cercis canadensis*, *Chamaesaracha conoides*, *Chrysanthemum maximum*, *Chrysopsis pilosa*, *Citrullis vulgaris*, *Coreopsis*, *Croptilon divaricatum* var. *divaricatum*, *Cucumis melo*, *Erigeron strigosus*, *Eupatorium serotinum*, *Helianthus annuus*, *Heterotheca subaxillaris*, *Leucophyllum frutescens*, *Marilaunidium organifolium*, *Marrubium vulgare*, *Melilotus alba*, *Mentha spicata*, *Monarda*, *Neomphila phacelioides*, *Opuntia Macrorhiza*, *Phacelia*, *Phyla incisa*, *Prosopis glandulosa*, *Pyrrhopappus geiseri*, *Rubus trivialis*, *Salix*, *Scutellaria*, *Sophora affinis*, *Sphaeralcea angustifolia*, *Tamarix gallica*, *Tetragonotheca ludoviciana*, *Tetraneurus linearifolia*, *T. scaposa*, *Verbesina encelioides*, *Vicia ludoviciana*, *Vitex agnus-castus*.  
*Ceratina shinnersi* Daly, 1973. Calif. Univ. Pubs. Ent. 74: 90, figs. 13f, 21, 22m-N, 28b. ♀, ♂.

#### SPECIES GROUP PACIFICA

**pacifica** Smith. B. C. to Calif., Idaho and Wyo., south to Ariz. Parasite: *Aprostocetus americanus* Ashm.?, *Rhydinofoenus kaweahensis* Bradley. Pollen: Apparently polylectic, visits flowers of *Agave nevadensis*, *Arctostaphylos*, *Asclepias*, *Aster andersonii*, *Balsamorhiza sagittaria*, *Calochortus luteus*, *C. macrocarpus*, *C. nuttallii*, *Ceanothus fendleri*, *Centaurea melitensis*, *Chaenactis*, *Chrysothamnus*, *Cirsium arvense*, *C. vulgare*, *Convolvulus occidentalis*, *Clematis linguisticifolia*, *Cleome lutea*, *Corethrogyne*, *Cryptantha intermedia*, *C. lepidia*, *C. racemosa*, *Encelia farinosa*, *Erigeron Eriodictyon trichocalyx* var. *lanatum*, *Eriogonum heermannii*, *Grindelia camporum*, *G. squarrosa*, *Haplopappus linearifolius*, *Helianthus annuus*, *H. petiolaris*, *Lomatium dissectum*, *Malacothrix tenuifolia*, *Navarretia heterodoxa*, *Medicago sativa*, *Mentzelia*, *Opuntia basilaris*, *Penstemon leonardi*, *Phacelia linearis*, *P. tanacetifolia*, *Rubus leucodermis*, *Senecio*, *Sisymbrium altissimum*, *Solidago petradoria*, *Sphaeralcea ambigua*, *S. angustifolia*, *Stanleya pinnata*, *Stephanomeria virgata*, *Trifolium*, *Verbena lasiostachys*, *Viguiera nevadensis*, *Wyethia glabra*.

*Ceratina pacifica* Smith, 1907. Amer. Ent. Soc., Trans. 33: 123. ♀.

*Ceratina subpunctigena* Michener, 1936. Amer. Mus. Novitates 844: 6. ♀, ♂.

*Ceratina utahensis* Michener, 1936. Amer. Mus. Novitates 844: 7. ♀.

**punctigena** Cockerell. Calif. Parasite: *Aprostocetus americanus* Ashm.?, *Coelopencyrtus hyleoleter* Burks, *Eurytoma apicalae* Bugbee, *Grotea californica* Cress. Pollen: Apparently polylectic, visits flowers of *Agoseris glauca*, *Aplopappus parishii*, *Arctostaphylos patula*, *Asclepias erosa*, *Calendula*, *Calochortus*, *Ceanothus*, *Chaenactis*, *Cirsium californicum*, *Clarkia dudleyana*, *Convolvulus occidentalis*, *Coreopsis lanceolata*, *Corethrogyne virgata*, *Croton californicus*, *Cryptantha intermedia*, *Cucurbita*, *Encelia farinosa*, *Eriodictyon trichocalyx* var. *lanatum*, *Eriophyllum tridactylum*, *Gilia*, *Hazardia squarrosa*, *Helianthus gracilentus*, *H. occidentalis*, *Hulsea callicarpa*, *Malacothrix saxatilis*, *M. s. tenuifolia*, *Penstemon incertus*, *P. spectabilis*, *Phacelia*, *Rhus trilobata*, *Salvia mellifera*, *Scrophularia californica*, *Senecio douglasii*, *Sphaeralcea*, *Stenotopsis linearifolius*, *Stephanomeria virgata*. Predator: *Oxyopes scalaris* Hentz.

*Ceratina neomexicana punctigena* Cockerell, 1916. Pomona Jour. Ent. Zool. 8: 62. ♀.

Taxonomy: Michener, 1936. Amer. Mus. Novitates 844: 5. ♀, ♂.

Biology: Linsley, MacSwain and Raven, 1963. Calif. Univ. Pubs. Ent. 33: 47 (floral relationships). — Bugbee, 1966. Pan-Pacific Ent. 42: 211 (natural enemies).



## SPECIES GROUP TEJONENSIS

**micheneri** Daly, Calif., Oreg. Pollen: Apparently polylectic, visits flowers of *Brassica campestris*, *Clarkia amoena*, *Convolvulus occidentalis*, *Corethrogyne*, *Cryptantha intermedia*, *Encelia californica*, *Grindelia robusta*, *Helianthus*, *Hypochoeris radicata*, *Potentilla*, *Rosmarinus officinalis*, *Salvia stachyoidea*, *Vaccinium ovatum*.  
*Ceratina micheneri* Daly, 1973. Calif. Univ. Pubs. Ent. 74: 59, figs. 6a, 8a, 9g, 11a, 11i, 12h, 20a, 29f. ♀, ♂.

**tejonensis** Cresson. Calif., Oreg. Parasite: *Grotea californica* Cress. Pollen: Apparently polylectic, visits flowers of *Amsinckia*, *Arctostaphylos drupacea*, *Barbarea orthoceras*, *Brassica*, *Brodiaea coronaria*, *B. grandiflora*, *B. laxa*, *Ceanothus crassifolius*, *Cirsium*, *Clarkia rhomboidea*, *Convolvulus occidentalis*, *Cucurbita*, *Diplacus aurantiacus*, *Epigonia*, *Eriodictyon*, *Helianthus gracilentus*, *Lepechinia calycina*, *Oenothera hookeri*, *Paeonia brownii*, *Penstemon grinnellii*, *Phacelia distans*, *Prunus amygdalus*, *Rubus ursinus*, *Salix*, *Salvia mellifera*, *Scrophularia californica*.  
*Ceratina tejonensis* Cresson, 1864. Ent. Soc. Phila., Proc. 2: 390. ♂.  
*Ceratina gigantea* Smith, 1907. Amer. Ent. Soc., Trans. 33: 123. ♀.

## SPECIES GROUP UNASSIGNED

**acantha** Provancher. B. C. to Calif., Idaho, Nev. and Utah; Mexico (Baja California). Parasite: *Aprostocetus americanus* Ashm., *Coelopencyrtus hyleoleter* Burks, *Grotea californica* Cress. Pollen: Polylectic, visits a great variety of flowers including *Achillea millefolium*, *Ageratum*, *Allium dichamydium*, *Anaphalis*, *Anthemis cotula*, *Anthriscus scandicina*, *Aralia californica*, *Arctostaphylos*, *Asclepias mexicana*, *Aster yosemitanus*, *Astragalus bolanderi*, *Baccharis douglasii*, *B. pilularis*, *Barbarea orthoceras*, *Bidens*, *Brassica adpressa*, *B. alba*, *B. campestris*, *B. geniculata*, *B. nigra*, *Brodiaea*, *Calochortus albus*, *C. luteus*, *Canna*, *Carduus tenuifolius*, *Ceanothus crassifolius*, *C. parvifolius*, *C. soredatus*, *Centaurea melitensis*, *C. solstitialis*, *Centaureum davyi*, *Chaenactis glabriuscula*, *Chaemabatia foliolosa*, *Chrysanthemum maximum*, *Chrysothamnus*, *Cicutia douglasii*, *Cirsium arvense*, *C. lanceolatum*, *C. vulgare*, *Clarkia amoena*, *huttoniana*, *C. rhomboidea*, *C. rubicunda*, *Claytonia*, *Clematis*, *Collinsia heterophylla*, *Convolvulus arvensis*, *C. occidentalis*, *Coreopsis maritima*, *Corethrogyne virgata*, *Cosmos*, *Cotoneaster*, *Cotula*, *Crepis vesicaria tarazacifolia*, *C. virens*, *Croton californicus*, *Cryptantha flaccida*, *C. intermedia*, *Daucus carota*, *Deinandra fasciculata*, *Diplacus aurantiacus*, *D. longiflorus*, *Dudleya*, *Echium giganteum*, *Encelia californica*, *Epilobium*, *Eriogonum stenophyllum*, *Eriogonum fasciculatum*, *E. latifolium nudum*, *E. vimineum*, *Eriodictyon californicum*, *Eriophyllum confertiflorum*, *E. lanatum*, *E. multicaule*, *E. staeckadifolium*, *Eryngium aristatum*, *Eschscholzia californicum*, *Foeniculum vulgare*, *Fragaria californica*, *Gaillardia*, *Galium*, *Geranium dissectum*, *G. molle*, *Gilia achilleaefolia*, *G. capitata*, *G. multicaulis*, *Glycyrrhiza lepidota*, *Gnaphalium californicum*, *Grindelia camporum*, *G. robusta latifolia*, *Haplopappus palmeri*, *Helenium bigelovii*, *H. puberulum*, *Helianthus gracilentus*, *Heliotropium curassavicum*, *Hemizonia fasciculata*, *Heracleum lanatum*, *Heteromeles arbutifolia*, *Heterotheca grandiflora*, *Holodiscus discolor*, *Hypericum*, *Hypochoeris radiata*, *Lactuca*, *Lasthenia chrysostoma*, *L. gracilis*, *Layia platyglossa*, *Lepechinia calycina*, *Lepidium*, *Linanthus parviflorus*, *Lomatium dissectum*, *Lonicera hispidula*, *Lotus corniculatus*, *L. glaber*, *L. scoparius*, *Madia*, *Malacothamnus arcuatus*, *Malacothrix saxatilis*, *Malvastrum fasciculatum*, *M. thurberi*, *Marrubium vulgare*, *Melilotus alba*, *Mentha spicata*, *Mesembryanthemum crystallinum*, *Micranthemum*, *Monardella lanceolata*, *M. villosa*, *Montia perfoliata*, *Myosotis laxa*, *Nasturtium*, *Navarretia heterodoxa*, *Nemophila exilis*, *N. heterophylla*, *Oenothera cheiranthifolia*, *Onkneria japonica*, *Opuntia*, *Paeonia brownii*, *Penstemon spectabilis*, *Perideridia gairdneri*, *Phacelia distans*, *Physocarpus capitatus*, *Plagiobothrys nothofolius*, *Polygonum auberti*, *Potentilla*, *Prunella vulgaris*, *Prunus ilicifolia*, *P. subcordata*, *Radicula nasturtium-aquaticum*, *Ranunculus californicus*, *Rhamnus californica*, *Ribes*, *Rosa*, *Rubus parviflorus*, *R. ursinus*, *Salix argophylla*, *S. lasiolepis*, *Salvia leucophylla*, *S. mellifera*, *Sambucus mexicana*, *Satureja douglasii*, *Scrophularia californica*, *Sedum*, *Senecio platylobus*, *Sidalcea malvaeflora*, *Silybum marianum*,

*Sisymbrium altissimum*, *Sisyrinchium*, *Solidago*, *Sonchus arvensis*, *Sphacele calycina*, *Spiraea sorbifolia*, *Stachys bullata*, *Stellaria media*, *Stephanomeria virgata*, *Syringa*, *Taraxacum vulgare*, *Trifolium involucreatum*, *T. microcephalum*, *Venegasia carpesioides*, *Verbena lasiostachys*, *V. prostrata*, *Vicia villosa*, *Vitis*, *Wyethia amplexicaulis glabra*. Predator: *Cymatodera ovipennis* Say.

*Ceratina acantha* Provancher, 1895. Nat. Canad. 22: 190. ♀.

*Ceratina submaritima* Cockerell, 1897. Acad. Nat. Sci. Phila., Proc. 49: 352. ♂, ♀.

*Ceratina submaritima ehrhorni* Cockerell, 1903. Ann. and Mag. Nat. Hist. (7) 12: 453. ♂.

Biology: MacSwain, 1945. Pan-Pacific Ent. 21: 97 (natural enemies). —Daly, 1966. Ent. Soc. Amer., Ann. 59: 1138 (nest).

**diodonta** Smith. Tex. Pollen: Unknown, but visits flowers of *Agastache breviflora*, *Lippia*, *Monarda citriodora*.

*Ceratina diodonta* Smith, 1907. Amer. Ent. Soc., Trans. 33: 121. ♂, ♀.

**melanoptera** Cockerell. Ariz., N. Mex., Tex. (El Paso); Mexico (Sonora). Pollen: Unknown, but visits flowers of *Argemone*, *Cassia leptocarpa*, *Dalea greggii*, *Encelia farinosa*, *Eriogonum*, *Haplopappus gracilis*, *Proboscidea parviflora*, *Salix taxifolia*, *Wedelia incarnata*.

*Ceratina melanoptera* Cockerell, 1924. Calif. Acad. Sci., Proc. (4) 12: 543. ♂, ♀.

**neomexicana** Cockerell. Idaho south to Calif., Nev., Ariz., N. Mex. and Tex. Pollen: Polylectic, visits a wide variety of flowers including *Agave*, *Amorpha fruticosa*, *Anemone intermedia*, *Aquilegia*, *Artemisia*, *Aster*, *Astragalus goniatus*, *Berberis trifoliata*, *Carduus Ceanothus*, *Chaenactis glabriuscula*, *Chrysopsis*, *Chrysothamnus nauseosus*, *Erigeron canus*, *E. inornatus*, *Gilia calcarea*, *Grindelia perennis*, *Haplopappus bloomeri angustatus*, *Helianthus petiolaris*, *Iris*, *Ligustrum vulgare*, *Malva cockerelli*, *Melilotus officinalis*, *Monarda*, *Nothocalais cuspidata*, *Oenothera*, *Opuntia erinacea*, *Penstemon gracilis*, *Phacelia*, *Physaria*, *Platycodon grandiflorum*, *Potentilla*, *Prunus*, *Pulsatilla hirsutissima*, *Rubus*, *Salix bebbiana*, *Senecio longilobus*, *Silphium*, *Solidago*, *Taraxacum officinale*, *Tetaneuris*, *Viola nuttallii*.

*Ceratina neomexicana* Cockerell, 1901. Ent. News 12: 43. ♀.

Taxonomy: Cockerell, 1906. Canad. Ent. 38: 165. ♂.

Biology: Hicks, 1926. Colo. Univ., Studies 15: 251 (nest).

**sequoiae** Michener. Wash., Idaho, Oreg. and Calif. Parasite: *Aprostocetus americanus* Ashm. Pollen: Oligolectic, obtains pollen from flowers of the genus *Clarkia* including *C. biloba*, *C. b. australis*, *C. cylindrica*, *C. dudleyana*, *C. gracilis albicaulis*, *C. purpurea*, *C. rhomboidea*, *C. unguiculata*, *C. williamsonii*, *C. xantiana*, *C. viminea*, but also visits other flowers for nectar such as *Amsinckia*, *Asclepias mexicana*, *Cryptantha*, *Epilobium*, *Eriogonum*, *Gilia tricolor*, *Hesperochiron*, *Layia platyglossa*, *Lepechinia calycina*, *Lessingia leptoclada*, *Lotus glaber*, *Madia*, *Mimulus*, *Nemophila*, *Oenothera*, *Penstemon*, *Phacelia*, *Ranunculus*, *Salvia*, *Sambucus*, *Scrophularia californica*, *Senecio*, *Stachys ajugoides*, *Trichostema laxum*, *Verbena lasiostachys*. Predator: *Apiomerus crassipes* (Fabr.).

*Ceratina sequoiae* Michener, 1936. Amer. Mus. Novitates 844: 1. ♀.

Biology: MacSwain, Raven and Thorp, 1973. Calif. Univ. Pubs. Ent. 70: 34-37 (floral relationships).

**timberlakei** Daly. Oreg., Calif. Pollen: Apparently polylectic, visits flowers of *Arctostaphylos*, *Asclepias mexicana*, *Calochortus luteus*, *Clarkia*, *Cucurbita*, *Eriodictyon californicum*, *Gilia capitata*, *Haplopappus arborescens*, *Lotus glaber*, *Prunus subcordata*, *Salvia*, *Senecio douglasii*, *Sidalcea calycosa*.

*Ceratina timberlakei* Daly, 1973. Calif. Univ. Pubs. Ent. 74: 102, figs. 7c, 10i, 12a, 27a, 28e, 31f, pl. 1. ♀, ♂.

#### Genus CERATINA Subgenus EUCERATINA Hirashima, Moure and Daly

*Ceratina* subg. *Euceratina* Hirashima, Moure and Daly, In Hirashima, 1971. Faculty Agr. Kyushu Univ., Jour. 16: 369.

Type-species: *Apis callosa* Fabricius. Orig. design.

The majority of the species included in this subgenus occur in Asia and Europe, but a few species are present in northern Africa. The species listed below is adventive, having been inadvertently introduced into California where it is successfully established.

**Taxonomy:** Hirashima, Moure and Daly, *In* Hirashima, 1971. Faculty Agr. Kyushu Univ., Jour. 16: 369-371, figs. 18-20 (descr., synopsis).

**dallatorreana** Friese. South. Europe and N. Africa; Calif. Successfully adventive in Calif. (Central Valley). Parasite: *Aprostocetus americanus* Ashm., *Eurytoma apicalae* Bugbee, *Grotea californica* Cress. Pollen: Presumably polylectic, visits flowers of *Centaurea solstitialis*, *Convolvulus arvensis*, *Cucurbita*, *Melilotus officinalis* in Calif.  
*Ceratina dallatorreana* Friese, 1896. Termesz. Fusetek, 19: 38, 50. ♂, ♀.

**Biology:** Daly, 1966. Ent. Soc. Amer., Ann. 59: 1138-1154, 17 figs., 5 tables (nest, floral records, immature stages, life history).

### TRIBE XYLOCOPINI

This tribe consists of generally large to very large, robust, pollen-collecting bees which occur on all the continents and many of the islands. Included are three genera, *Lestis* with two species in eastern Australia, *Proxycopa* with 22 members centered in the more arid parts of the southwestern Palaearctic Region and *Xylocopa* with more than 600 nominal forms, the majority of which are found in the Ethiopian and Neotropical Regions.

Even though most members of this tribe (*Lestis* and *Xylocopa*) construct their nests in a wide variety of usually dead plant materials, one group of species (*Proxycopa*), insofar as known, make their nests in the ground.

**Revision:** Hurd and Moure, 1963. Calif. Univ. Pubs. Ent. 29: 1-365, 244 figs., 1 frontispiece (classification, includes biological information).

### Genus XYLOCOPA Latreille

**Taxonomy:** Ackerman, 1916. N. Y. Ent. Soc., Jour. 24: 196-232, 1 pl. (U. S. spp.). —Hurd, 1955. Calif. Ins. Surv. Bul. 4: 35-72, 4 pls., 4 maps (U. S. spp.). —Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 507-511, figs. 126-127 (eastern U. S. spp.).

**Biology:** Malyshev, 1931. Ztschr. f. Morph. u. Okol. der Tiere (Abt. A. der Ztschr. f. wiss. Biol.). 23 (3-4): 754-809, 15 figs. (nest, life history). —Hurd, 1958. Ent. Soc. Amer., Ann. 51: 365-375, 5 figs. (nesting habits). —Hurd, 1959. Kansas Ent. Soc., Jour. 32: 53-58, 1 fig. (beefly parasitism).

**Morphology:** Wille, 1958. Ent. Soc. Amer., Ann. 51: 539-545 (dorsal vessel).

### Genus XYLOCOPA Subgenus XYLOCOPA Latreille

*Xylocopa* Latreille, 1802. Hist. Nat. Fourmis, p. 432. Name suppressed by Internatl. Comn. Zool. Nomencl., Op. 743, 1965.

*Xylocopa* Latreille, 1802. Hist. Nat. Crust. Ins., v. 3, p. 379. Name placed on Official List of Generic Names in Zool. by Internatl. Comn. Zool. Nomencl., Op. 743, 1965.

Type-species: *Apis violacea* Linnaeus. Desig. by Westwood, 1840.

This subgenus occurs in the western Palaearctic.

### Genus XYLOCOPA Subgenus SCHOENHERRIA Lepeletier

*Xylocopa* subg. *Schoenherria* Lepeletier, 1841. Hist. Nat. Ins., Hym., v. 2, p. 207.

Type-species: *Xylocopa micans* Lepeletier. Desig. by Sandhouse, 1943.

**loripes** Smith. Southeast. Ariz.; Mexico south to Honduras. Pollen: Unknown, but visits flowers of *Bougainvillea*, *Crotalaria*.

*Xylocopa loripes* Smith, 1874. Ent. Soc. London, Trans., p. 298. ♂.

*Xylocopa formosa* Smith, 1874. Ent. Soc. London, Trans., p. 299. ♀.

**micans** Lepeletier. Southeast. Va. to Fla., west along Gulf Coast states to Texas; Mexico (Tamaulipas). Ecology: Nests in sound, dead privet. Pollen: Polylectic, visits flowers of *Aesculus*, *Azalea*, *Bidens leucantha*, *Calopogon pulchellus*, *Carduus spinosissimus*,

*Cephalanthus*, *Cercidium*, *Chaemaecrista brachiata*, *Cicuta*, *Crotalaria pumila*, *Dalbergia ecastophyllum*, *Galactia*, *Glycine*, *Gossypium*, *Hibiscus*, *Ilex*, *Ligustrum*, *Lythrum alatum*, *L. lineare*, *Medicago*, *Melilotus*, *Parkinsonia*, *Passiflora incarnata*, *Phaseolus*, *Philibertia clausa*, *Prosopis*, *Prunus*, *Rhus*, *Richardia*, *Sabal palmetto*, *Senecio*, *Serenoa serrulata*, *Solanum bahamense*, *S. wendlandii*, *Solidago*, *Stachys*, *Suriana*, *Verbena brasiliensis*, *Vernonia*.

?*Apis nasuta* Christ, 1791. Naturg. Klassif., Nomencl. Ins. Bienen-, Wespen-, Ameisengeschl., v. 8, p. 130.

*Xylocopa micans* Lepeletier, 1841. Hist. Nat. Ins., Hym., v. 2, p. 208. ♂.

*Xylocopa vidua* Lepeletier, 1841. Hist. Nat. Ins., Hym., v. 2, p. 210. ♀.

*Xylocopa purpurea* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 284. ♀.

Biology: Hurd, 1958. Ent. Soc. Amer., Ann. 51: 373, fig. 4 (nest).

Morphology: Maidl, 1912. Zool.-bot. Gesell., Verh. 62: 19-26, figs. 1-5 (gynandromorph).

### Genus XYLOCOPA Subgenus NOTOXYLOCOPA Hurd

*Xylocopa* subg. *Notoxylocopa* Hurd, 1956. Amer. Mus. Novitates 1776: 2.

Type-species: *Xylocopa tabaniformis* Smith. Orig. desig.

Revision: O'Brien and Hurd, 1965. Ent. Soc. Amer., Ann. 58: 175-196, 38 figs. (taxonomy, distr., nesting substrates).

**tabaniformis androleuca** Michener. West. N. Mex. to Utah, Nev., Ariz. and south. Calif.; Mexico (Baja California and Sonora). Ecology: Nests in structural Douglas fir timbers and possibly native juniper. Pollen: Apparently polylectic, visits flowers of *Asclepias*, *Cucurbita pepo*, *Larrea tridentata*, *Oenothera parryi*, *Parkinsonia aculeata*, *Penstemon barbatus*, *Stanleya pinnata*.

*Xylocopa orpifex androleuca* Michener, 1940. South. Calif. Acad. Sci., Bul. 39: 127. ♂, ♀.

Biology: Hurd, 1958. Ent. Soc. Amer., Ann. 51: 373 (nesting habits). — Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 47 (floral relationships with *Larrea tridentata*).

**tabaniformis orpifex** Smith. Oreg., Calif.; Mexico (Baja California). Ecology: Nests in sound, dead, native softwoods including *Alnus rhombifolia*, *Juniperus*, *Libocedrus decurrens*, *Populus*, *Pseudotsuga menziesii*, *Sequoia sempervirens*, *Sequoiadendron gigantea*. Parasite: *Anthrax delila* (Loew.), *A. tigrinus* (DeG.), *Monodontomerus montivagus* Ashm., *Nemognatha scutellaris* Say. Pollen: Polylectic, visits a wide variety of native and introduced flowers including *Althaea rosea*, *Antirrhinum*, *Arctostaphylos patula*, *Asclepias*, *Brassica*, *Ceanothus crassifolius*, *C. integerrimus*, *Cestrum*, *Chrysothamnus*, *Cirsium*, *Citrus lemon*, *Clarkia breweri*, *C. concinna*, *C. elegans*, *C. gracilis*, *C. g. albicaulis*, *C. mildrediae*, *C. unguiculata*, *Cordylanthus nevinii*, *Cucurbita*, *Delphinium*, *Dicentra chrysantha*, *Diplacus aurantiacus*, *D. puniceus*, *Eriastrum virgatum*, *Eriodictyon californicum*, *Fremontia*, *Fuchsia*, *Haplopappus parishii*, *Isomeris arborea*, *Larrea tridentata*, *Lathyrus odoratus*, *Lepidospartum squamatum*, *Lonicera japonica*, *Lotus scoparius*, *Lupinus densiflorus*, *L. grayi*, *Medicago sativa*, *Mentzelia laevicaulis*, *Mimulus cardinalis*, *Mirabilis*, *Monardella*, *Oenothera deltoidea*, *O. hookeri*, *Penstemon breviflorus*, *P. bridgesii*, *P. grinnellii*, *P. labrosus*, *Phacelia davidsonii*, *P. distans*, *P. heterophylla*, *P. ternatus*, *Rhododendron occidentale*, *Ribes*, *Rubus*, *Salvia mellifera*, *Solanum umbelliferum*, *Solidago*, *Stachys albens*, *S. ajugoides*, *Thermopsis macrophyllus*, *Trichostema lanceolatum*, *Verbascum blattaria*, *Wistaria*, *Wyethia*.  
*Xylocopa orpifex* Smith, 1874. Ent. Soc. London, Trans., p. 298. ♀, ♂.  
*Xylocopa orpifera*(!) Dalla Torre, 1896. Cat. Hym., v. 10, p. 216. Lapsus calami.  
*Xylocopa orpifex*(!) Malyshev, 1931. Ztsch. Morph. Okol. Tiere (A) 23: (3-4): 788. Lapsus calami.

Biology: Davidson, 1893. Ent. News 4: 151-153 (nest, life history, parasite). — Nining, 1916. Pomona Jour. Ent. Zool. 8: 158-165 (life history, parasite). — Hurd, 1959. Kans. Ent. Soc., Jour. 32: 54-56 (beefly parasitism). — Straw, 1956. Amer. Midland Nat. 90: 47-53 (floral relationships with *Penstemon*). — Cruden, 1966. Pan-Pacific Ent. 42: 111-119, 3 figs. (territorial behavior). — Marston, 1970. Smithsn. Contrib. Zool. 43: 116 (beefly parasitism).

- tabaniformis parkinsoniae** Cockerell. South. Tex.; Mexico. Ecology: Nests in dead cottonwood. Pollen: Unknown, but visits flowers of *Cercidium*, *Citrus*, *Parkinsonia aculeata*, *Verbesina encelioides*. Other subspecies, including typical *tabaniformis*, occur from Mexico to Ecuador.
- Xylocopa tabaniformis parkinsoniae* Cockerell, 1917. In W. P. Cockerell. N. Y. Ent. Soc., Jour. 25: 192. ♀.

### Genus XYLOCOPA Subgenus XYLOCOPOIDES Michener

- Xylocopa* subg. *Xylocopoides* Michener, 1954. Amer. Mus. Nat. Hist., Bul. 104: 155.  
Type species: *Apis virginica* Linnaeus. Orig. desig.

Taxonomy: Hurd, 1961. Amer. Ent. Soc., Trans. 87: 247-257, 2 pls. (synopsis). — Hurd and Moure, 1963. Calif. Univ. Pubs. Ent. 29: 140-142 (revised keys to spp. and subsp.).

- californica arizonensis** Cresson. Tex. to south. Calif., Nev., and Utah; Mexico. Ecology: Nests in sound, dead, native softwoods including *Agave*, *Dasyllirion*, *Nolina* *Yucca*, but will also nest in structural redwood when used for construction within its geographic range. Parasite: *Anthrax xylocopae* Marston. Pollen: Polylectic, visits a wide variety of flowers including those of *Acacia angustissima*, *A. greggii*, *Agave nevadensis*, *Aloysia wrightii*, *Argemone platyceras*, *Asclepias subverticillata*, *Baccharis*, *Bigelovia*, *Cercocarpus*, *Chilopsis linearis*, *C. saligna*, *Chrysothamnus nauseosus*, *Cirsium*, *Citrus*, *Cleome*, *Cryptantha oblata*, *Cucurbita maxima*, *C. mixta*, *C. moschata*, *C. pepo*, *Dalea albiflora*, *Datura meteloides*, *Delphinium andesicola*, *Fendlera*, *Fouquieria splendens*, *Gaillardia pulchella*, *Gaura coccinea*, *Gossypium*, *Heterotheca subaxillaris*, *Hyptis emoryi*, *Kallstroemia grandiflora*, *Koeberlinia spinosa*, *Larrea tridentata*, *Lepidospartum squamatum*, *Lippia lycioides*, *Lupinus magnificus*, *Medicago sativa*, *Melilotus alba*, *Nama parryi*, *Mentzelia pumila*, *Parkinsonia aculeata*, *Penstemon*, *Prosopis glandulosa* var. *torreyanum*, *Ratibida columnaris*, *Rhus laurina*, *R. trilobata*, *Robinia neomexicana luxurians*, *Rubus*, *Salvia lemmoni*, *Senecio longilobus*, *S. salignus*, *Solanum elaeagnifolium*, *Solidago*, *Sphaeralcea*, *Stanleya pinnata*, *Thurberia*, *Viguiera longifolia*, *Wislizenia refracta*, *W. r.* var. *mamillata*, *Yucca brevifolia*, *Y. elata*, *Y. whipplei*.

*Xylocopa arizonensis* Cresson, 1879. Amer. Ent. Soc., Trans. 7: 212. ♀, ♂.

- Biology: Hurd, 1958. Ent. Soc. Amer., Ann. 51: 369-371 (nest). — Hurd, 1959. Kans. Ent. Soc., Jour. 32: 57-58 (nest, beefly parasitism). — O'Brien and O'Brien, 1966. Pan-Pacific Ent. 42: 27-29 (nest, territoriality). — Marston, 1970. Smithsn. Contrib. Zool. 43: 118 (beefly parasitism). — Hurd and Linsley, 1975. Smithsn. Contr. Zool. 193: 47, fig. 18 (floral relationships).

- californica californica** Cresson. Oreg. (Cascade Mts.), Calif. (North, Coast Ranges and Sierra Nevada Mts.). Ecology: Nests in sound, dead, native softwoods including *Libocedrus decurrens*, *Sequoia sempervirens*, *Sequoiadendron gigantea*. Pollen: Polylectic, visits flowers of *Aesculus californica*, *Agastache urticifolia*, *Arctostaphylos*, *Asclepias speciosa*, *Ceanothus integerrimus*, *Cercis occidentalis*, *Chrysothamnus*, *Clarkia dudleyana*, *C. elegans*, *C. unguiculata*, *Epigonion*, *Epilobium angustifolium*, *Eriodictyon californicum*, *Lupinus albiflorus*, *Medicago sativa*, *Mentha pulegium*, *Monardella lanceolata*, *Penstemon breviflorus*, *P. grinnellii*, *Phacelia heterophylla*, *Ranunculus*, *Solidago occidentalis*, *Yucca whipplei*.

*Xylocopa californica* Cresson, 1864. Ent. Soc. Phila., Proc. 3: 40. ♀.

*Xylocopa amblardi* Perez, 1901. Act. Soc. Linn. Bordeaux 56: 115. ♂.

*Xylocopa libocedri* Cockerell, 1914. Insecutor Inscitiae Menstruus 2: 101. ♂, ♀.

- Biology: Cruden, 1966. Pan-Pacific Ent. 42: 111-119, 3 figs. (nest, territorial and copulatory behavior).

- californica diamesa** Hurd. Calif. (Centr. and south. coast ranges); Mexico (Baja California).

Ecology: Nests in dead floral scapes of *Yucca whipplei*. Pollen: Polylectic, visits flowers of *Arctostaphylos patula*, *Asclepias mexicana*, *Apocynum androsaemifolium*, *Argemone platyceras*, *Ceanothus*, *Chrysothamnus bernardinus*, *C. nauseosus*, *Cucurbita foetidissima*, *Dicentra chrysantha*, *Eriogonum fasciculatum*, *Fremontia*

*californica*, *Haplopappus linearifolius*, *H. parishii*, *Isomeris arborea*, *Larrea tridentata*, *Lepidospartum*, *Ligustrum*, *Lupinus austromontanus*, *L. grayi*, *L. parishii*, *Penstemon palmeri*, *Phacelia heterophylla*, *Salvia*, *Stachys*, *Stanleya pinnata*, *Yucca whipplei*.

*Xylocopa californica diamesa* Hurd, 1954. Pan-Pacific Ent. 30: 202. ♂, ♀.

*virginica krombeini* Hurd. Southern Fla. Predator: *Horstia virginica* Baker.

*Xylocopa (Xylocopoides) virginica krombeini* Hurd, 1961. Amer. Ent. Soc., Trans. 87: 251. ♂, ♀.

Biology: Krombein, 1967. Trap-nesting wasps and bees, pp. 347-348, pl. 20, fig. 101 (nest architecture, life history, predator).

*virginica texana* Cresson. South. Kans. to Tex. Pollen: Apparently polylectic, visits flowers of *Asclepias*, *Calyophus serrulata*, *Cercis canadensis*, *Eryngium*, *Passiflora incarnata*, *Rubus*, *Salvia pitcheri*, *Vitex*.

*Xylocopa texana* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 283. ♂, ♀.

*virginica virginica* (Linnaeus). New England and adjacent Canada (Great Lakes region), south to centr. Fla., west to Nebr., Kans., Okla. and east. Tex. Ecology: Nests in dead, sound wood of many kinds of trees, including structural timbers. Parasite: *Anthrax tigrinus* (DeG.), *Villa sinuosus* (Wied.). Pollen: Polylectic, visits flowers of a wide variety of both native and introduced plants including *Abelia*, *Amsonia tabernaemontana*, *Amygdalus persica*, *Aquilegia vulgaris*, *Asclepias incarnata*, *A. pulchra*, *A. tomentosa*, *Azalea*, *Barbarea barbarea*, *Bidens*, *Brauneria*, *Ceanothus ovatus*, *Cornus*, *Cyrilla racemiflora*, *Diervilla japonica*, *Diospyros kaki*, *Eupatorium perfoliatum*, *Ilex*, *Lespedeza*, *Lonicera flava*, *L. japonica*, *Lythrum alatum*, *Malus*, *Medicago sativa*, *Melilotus alba*, *Mertensia*, *Monarda*, *Opuntia*, *Passiflora incarnata*, *Pedicularis canadensis*, *Petalostemon*, *Petunia*, *Phlomis tuberosa*, *Phlox divaricata*, *Physostegia*, *Plumbago capensis*, *Prunus*, *Rhododendron nudiflorum*, *Rhus glabra*, *Robinia pseudoacacia*, *Rubus*, *Salvia azurea grandiflora*, *Sassafras*, *Solidago canadensis*, *Stachys*, *Symphytum officinale*, *Syringa vulgaris*, *Trifolium incarnatum*, *T. pratense*, *Vaccinium corymbosum*, *V. vacillans*, *Verbena*, *Viburnum molle*, *Vicia villosa*, *Wistaria sinensis*. Predator: Woodpeckers and orioles.

*Apis Virginica* Linnaeus, 1771. Mant. Plant., v. 2, p. 450.

*Apis Virginica* Drury, 1773. Illust. Nat. Hist. Exotic Ins., v. 1 (index), p. 2.

*Apis analis* Fabricius, 1775. Systema Ent., p. 384.

*Centris carolina* Fabricius, 1804. Systema Piezatorum, p. 357. ♂.

Taxonomy: Michener, 1953. Kans. Univ. Sci. Bul. 35: 1062, figs. 167-172 (larva). — Hurd, 1955. Calif. Ins. Surv., Bul. 4: 50, map 1 (distribution, floral records, nesting substrates).

— Moure, 1960. Studia Ent. 3: 160 (synonymy).

Biology: Angus, 1868. Amer. Nat. 1: 157 (parasite). — Walsh, 1868. Amer. Ent. 1: 9, f. 4 (habits, nest). — Packard, 1868. Amer. Nat. 1: 369-371, pl. 10, figs. 3-7 (nest, life history, parasite). — Angus, 1869. Amer. Nat. 2: 48 (parasite). — Angus, 1869. Amer. Nat. 2: 49 (hibernation). — Packard, 1869. Guide to the study of insects, pp. 132-134, pl. 4 (habits). — Campbell, 1873. Nature 8: 253 (predation by Baltimore orioles). — Packard, 1873. Our common insects, p. 21-24 (habits). — Gentry, 1875. Amer. Nat. 9: 264-266 (pollination). — Turner, 1878. Amer. Nat. 12: 627-628 (nest, predation by woodpeckers). — Mann, 1882. Psyche 3: 298 (flower piercing habits). — Murtfeldt, 1882. Psyche 3: 343 (flower piercing habits). — Pammel, 1888. Acad. Sci. St. Louis, Trans. 5: 241-277 (pollination, flower piercing habits). — Howard, 1892. Ent. Soc. Wash., Proc. 2: 331 (hibernation). — Howard, 1902. The insect book. N. Y.: Doubleday, Page and Co., p. 9 (nest). — Ashmead, 1894. Psyche 7: 23 (nesting habits). — Comstock and Comstock, 1895. Manual for Study of Insects, p. 670 (nesting habits). — Adams, 1915. Ill. State Lab. Nat. Hist., Bul. 11: 45, 47, 104, 198-199 (life history). — Burrill, 1925. Science (n. s.) 62 (1597): 134 (flower piercing habits). — Rau, 1926. Acad. Sci. St. Louis, Trans. 25: 162 (life history, parasite). — Rau, 1929. Jour. Compar. Psychol. 9: 37 (homing experimentation). — Rau, 1931. Jour. Compar. Psychol. 12: 257 (homing experimentation). — Rau, 1933. The jungle bees and wasps of Barro Colorado Island. Publ. by Phil Rau, Kirkwood, St. Louis Co., Mo., pp. 225-226, figs. (habits and instincts, life history). — Burrill, 1934. Missouri State Museum, Bul. 11: 3-4 (flower piercing habits). — Weiss and Smith, 1940. U. S. Dept. Agr. Circular 556: 16-19, fig. (flower-spot

disease transmission). — Franklin, 1951. Kans. Agr. Expt. Sta. Tech. Bul. 70: 1-64 (pollination). — Hurd, 1955. Calif. Ins. Surv., Bul. 4: 50 (nesting substrates). — Chandler, 1958. Pest Control 26: 36, 38, 40, 47, 3 figs. (economic damage). — Hurd, 1958. Ent. Soc. Amer., Ann. 51: 368, 373-374, fig. 5 (nesting substrates). — Hurd, 1959. Kans. Ent. Soc., Jour. 32: 56-57 (beefly parasitism). — Balduf, 1961. Brooklyn Ent. Soc., Bul. 56: 81-84 (nest associates). — Balduf, 1962. Ent. Soc. Amer., Ann. 55: 263-271, 3 figs. (life history). — Sabrosky, 1962. Ent. Soc. Wash., Proc. 64: 184 (mating behavior). — Dorr and Martin, 1966. Michigan Quart. Bul. 48: 445 (flower piercing habits). — Krombein, 1967. Trap-nesting wasps and bees, pp. 345-346 (nest architecture, life history). — Marston, 1970. Smithsn. Contrib. Zool. 43: 119 (beefly parasitism). — Gerling and Hermann, 1976. Entomophaga 21: 227-223, 3 figs., 3 tables (beefly parasitism).

Morphology: Milliron, 1958. Brooklyn Ent. Soc., Bul. 53: 66-68 (gynandromorph).

### Genus XYLOCOPA Subgenus NEOXYLOCOPA Michener

*Xylocopa* subg. *Neoxylocopa* Michener, 1954. Amer. Mus. Nat. Hist., Bul. 104: 157.

Type-species: *Apis brasilianorum* Linnaeus. Orig. desig.

**mexicanorum** Cockerell. Tex. to east. Ariz.; Mexico.

*Xylocopa mexicanorum* Cockerell, 1912. Ann. and Mag. Nat. Hist. (8) 9: 555. ♀.

**varipuncta** Patton. Ariz., Nev., Calif.; Mexico. Ecology: Nests in rotting or decaying wood.

Parasite: ?*Anthrax simson habrosus* Marston. Pollen: Polylectic, visits a wide variety of flowers including *Acacia*, *Argemone*, *Asclepias*, *Astragalus parishii*, *Brassica campestris*, *Buddleia*, *Calliopsis*, *Ceanothus hookeri*, *Cercidium Torreyanum*, *Cucurbita foetidissima*, *C. maxima*, *C. mixta*, *C. moschata*, *C. pepo*, *Datura meteloides*, *Eschscholzia californica*, *Gossypium*, *Lantana camara*, *Larrea tridentata*, *Lathyrus odoratus*, *Lonicera japonica*, *Lupinus paynei*, *Lycopersicum esculentum*, *Medicago sativa*, *Oenothera hookeri*, *Parkinsonia aculeata*, *Passiflora*, *Penstemon antirrhinoides*, *Prosopis glandulosa* var. *torreyanum*, *Salvia*, *Sesbania macrocarpa*, *Solanum douglasii*, *S. elaeagnifolium*, *Sphaeralcea emoryi*, *Trichostema lanceolatum*, *Vitex pyramidata*, *Wislizenia refracta*, *W. r.* var. *mamillata*, *Wistaria*. *X. sonorina* Smith, described from Hawaii, has been regarded by some investigators as a senior synonym. *Xylocopa varipuncta* Patton, 1879. Canad. Ent. 11: 60. ♀.

Biology: Nininger, 1916. Pomona Jour. Ent. Zool. 8: 164-165 (nest, life table data). — Hurd, 1958. Ent. Soc. Amer., Ann. 51: 369, fig. 1. — Janzen, 1964. Pan-Pacific Ent. 40: 65-66 (nest). — Marston, 1970. Smithsn. Contrib. Zool. 43: 5 (possible parasite). — Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 47-48 (intrafloral ecology).

Morphology: Gordh and Gulmahamad, 1975. Ent. Soc. Wash., Proc. 77: 269-273, 8 figs. (gynandromorph).

### Genus XYLOCOPA Subgenus STENOXYLOCOPA Hurd and Moure

*Xylocopa* subg. *Stenoxylocopa* Hurd and Moure, 1960. Ent. Soc. Amer., Ann. 53: 809.

Type-species: *Xylocopa artifex* Smith. Orig. desig.

Taxonomy: Hurd and Moure, 1960. Ent. Soc. Amer., Ann. 53: 809-821, 14 figs., 2 tables (synopsis and summary of biological information).

**artifex** Smith. Mts. of south. Ariz. to Argentina. Ecology: Nests in hollow culms, usually dead, of bamboo and related plants including *Arundo donax*, *Chusquea bambusoidea*, *Guadua*, *Merostachys clauseni*. Pollen: Presumably polylectic, visits in South America flowers of *Baccharis dracunculifolia*, *Cassia bicapsularis*, *C. splendida*, *Crotalaria paulina*, *Leonurus sibiricus*, *Passiflora*, *Solanum atropurpureum*, *S. balbisii*, *S. paniculatum*, *Tecoma ipe*.

*Xylocopa artifex* Smith, 1874. Ent. Soc. London, Trans., p. 289. ♀.

*Xylocopa erratica* Smith, 1874. Ent. Soc. London, Trans., p. 293. ♂.

Taxonomy: Hurd, 1955. Calif. Ins. Surv., Bul. 4: 62-63 (synonymy, distribution).

Biology: Schrottky, 1902. Rev. Mus. Paulista 5: 468 (floral records). —Schrottky, 1904. Allgem. Ztschr. Ent. 9: 344-349 (nest). —Strand, 1912. Zool. Jahrb. Abt. Syst. 33: 267 (nest). —Bertoni, 1918. An. Cient. Paraguayos (2) 3: 219 (nest). —Moure, 1942. Papeis Avulsos Dept. Zool., Secretaria Agr. Sao Paulo 2: 301 (nest). —Hurd and Moure, 1960. Ent. Soc. Amer., Ann. 53: 819-820 (nest substrates).

### Family APIDAE

Species of this family are found throughout much of the world from the high Arctic latitudes to or near the southern limits of the major land masses of the Southern Hemisphere. The family consists of two subfamilies, the Bombinae which includes the orchid bees (Euglossini) and bumblebees (Bombini) and the Apinae which contains the stingless honeybees (Meliponini) and the familiar stinging honeybees (Apini). Some of these bees are of exceptional value to man not only because of their production of honey and other products, but also because they pollinate many agricultural and other plants. Although the family contains some social parasites (e.g., *Aglae*, *Exaerete* and *Psithyrus*) and nest robbers (e.g., *Lestrimelitta*), the pollen-collecting females, unlike those of any other family of bees, transport pollen by means of specialized pollen baskets (corbiculae) located on the hind tibiae. Virtually all stages of social development are exhibited by the family. These include all of the highly eusocial bees (Apinae) which live in perennial colonies as well as the primitively eusocial bumblebees and the solitary and parasocial Euglossini.

In America north of Mexico the family is represented most conspicuously by the introduced European honeybee (*Apis mellifera* Linnaeus) and the many native species of bumblebees. The only other member of this family present in the United States is a species of the Neotropical genus *Eulaema* which was found years ago in the vicinity of Brownsville, Texas. In spite of repeated attempts to introduce various species of meliponine bees into the United States none of these introductions has been successful.

Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 513-546, figs. 128-134, table 18 (east. U. S. spp.). —Winston and Michener, 1977. Natl. Acad. Sci., U. S. A., Proc. 74: 1135-1137 (phylogeny).

Biology: Michener, 1974. The Social Behavior of Bees, 404 pp., Cambridge, Massachusetts, The Belknap Press of Harvard University Press.

Morphology: Lello, 1976. Kans. Ent. Soc., Jour. 49: 85-99, 22 figs., 3 tables (adnexal glands of the sting apparatus).

### SUBFAMILY BOMBINAE

This subfamily contains two tribes, the Euglossini which is found only in the Neotropical Region and the Bombini which, although chiefly Holarctic in occurrence, is represented by a number of species in both the Oriental and Neotropical Regions. Several species of this latter tribe have been successfully introduced into the Australian Region (New Zealand).

### TRIBE EUGLOSSINI

These bees, which are found only in the Americas (Chihuahua, Sonora, and Texas to Argentina) are centered in the tropics and are most abundant and diverse in the forested regions. The tribe consists of six genera, four of which contain pollen-collecting species (*Eufriesea*, *Euglossa*, *Eulaema*, and *Euplusia*) and two others (*Aglae* and *Exaerete*) whose species are social parasites in the nests of the pollen-collecting Euglossini. Many of the species are large and brilliantly metallic while others are clothed with contrasting patterns of black and white or yellow and white pubescence reminiscent of bumblebees. The males of many, if not all, pollen-collecting species, unlike most females, are selectively attracted to the flowers of one or more species of orchids, many of which produce little or no nectar and evidently no food. The attraction of the males to these flowers is not fully understood. It is believed that lek behavior is involved and that the males seek certain substances from these flowers, as well as from other sources, and store these in the organs of their greatly enlarged hind tibiae. It has been suggested that these substances are converted into sex pheromones, possibly species-specific, which are used to attract females responsive to mating. The males of different species visit the flowers of different species of orchids and often dislodge pollinia which adhere to the head, thorax or legs. Thus



transported to other flowers of the same species, the pollinia are readily available to effect pollination. This bee-plant (bee-flower) relationship obviously has important implications relative to the evolution of orchids and these bees.

Taxonomy: Moure, 1950. *Dusen* 1: 181-200 (included genera). — Moure, 1963. *Rev. Biol.*

Tropical 11: 211-216 (tax. characters, key to included genera). — Moure, 1967. *Atas Simposio Biota Amazonica* 5 (Zool.): 395-415 (checklist of included genera and spp.).

Biology: Dodson and Frymire, 1961. *Mo. Bot. Garden, Bul.* 49: 133-152 (floral relationships).

— Dodson and Frymire, 1961. *Mo. Bot. Garden, Ann.* 48: 137-172 (floral relationships).

— Dodson, 1962. *Mo. Bot. Garden, Ann.* 49: 35-36 (orchid pollination). — Vogel, 1963. *Osterr. Bot. Ztschr.* 110: 308-337 (orchid pollination). — Bennett, 1965. *Ins. Sociaux* 12: 81-91 (social behavior). — Pijl and Dodson, 1966. *Orchid flowers; their pollination and evolution*, 214 pp. (intrafloral relationships). — Vogel, 1966. *Osterr. Bot. Ztschr.* 113: 302-361 (orchid

pollination). — Dodson, 1966. *Kans. Ent. Soc., Jour.* 39: 607-629 (ethology). — Dressler, 1967. *Atas Simposio Biota Amazonica* 5 (Zool.): 171-180 (pollination syndrome). — Zucchi and

Camargo, 1969. *Fac. Sci. Hokkaido Univ., ser. 6, Zool.* 17: 271-380, 2 pls., 21 figs., 9 tables (review of biology). — Dodson, 1970. *Biochemical Coevolution*, *Oreg. State Univ. Press*, pp. 83-107 (role of chemical attractants in orchid pollination). — Janzen, 1971. *Science* 171:

203-205 (long distance pollination). — Evoy and Jones, 1971. *Anim. Behavior* 19: 579-584 (motor patterns evoked in males by floral fragrances). — Bennett, 1972. *N. Y. Ent. Soc., Jour.* 80: 137-145 (attraction and collection by use of baited McPhail fruitfly traps).

— Williams and Dodson, 1972. *Evolution* 26: 84-95, 4 figs., 5 tables (selective attraction of males to orchid floral fragrances). — Michener, 1974. *The Social Behavior of Bees*, Chapter 21: 257-260 (natural history of orchid bees). — Dodson, 1975. *In* Gilbert and Raven,

*Coevolution of plants and animals*, pp. 91-99, 2 figs. (coevolution with orchids).

Morphology: Lanham, 1951. *Pan-Pacific Ent.* 27: 181-182 (jugal brush). — Cruz-Landim, Stort, Costa Cruz and Kitajima, 1965. *Rev. Brasil. Biol.* 25: 323-342 (tibial organs of males).

— Hills, Williams and Dodson, 1968. *Amer. Orchid Soc., Bul.* 37: 967-971 (identification of odor compounds in orchid fragrances). — Dodson, Dressler, Hills, Adams and Williams, 1969. *Science* 164: 1243-1249 (chemical substances in orchid fragrances attractive to males).

### Genus EULAEMA Lepeletier

Taxonomy: Moure, 1950. *Dusen* 1: 181-200 (key to related genera, key to included spp.,

synonymy and tax., bibliography of included spp.). — Moure, 1960. *Studia Ent.* 3: 145-147 (Fabrician Types). — Moure, 1967. *Atas Simposio Biota Amazonica* 5 (Zool.): 410-413, fig. 1 (checklist of included spp.).

### Genus EULAEMA Subgenus EULAEMA Lepeletier

*Eulaema* Lepeletier, 1841. *Hist. Nat. Ins., Hym.*, v. 2, p. 11. Name placed on Official List of Generic Names in Zool. by Internatl. Comn. Zool. Nomencl., Op. 567, 1959.

Type-species: *Apis dimidiata* Fabricius. Desig. by Taschenberg, 1883, as validated by Internatl. Comn. Zool. Nomencl., Op. 567, 1959.

*Eulaenis*(?) Spinola, 1851. *In* Gay, *Hist. Fiscia Polit. Chile*, Zool., v. 6, p. 167.

*Eulema* Dalla Torre, 1896. *Cat. Hym.*, v. 10, p. 309. Emend.

This subgenus does not occur in America north of Mexico.

### Genus EULAEMA Subgenus APEULAEMA Moure

*Eulaema* subg. *Apeulaema* Moure, 1950. *Dusen* 1: 184.

Type-species: *Centris cingulata* Fabricius. Orig. desig. (= *Eulaema fasciata* Lepeletier).

*polychroma* (Mocsary). *Tex.* (Brownsville); Mexico (Sonora) south to Ecuador and Peru.

*Euglossa polychroma* Mocsary, 1899. *Termes. Fuzetek* 22: 170. ♂.

Taxonomy: Moure, 1967. *Atas Simposio Biota Amazonica* 5 (Zool.): 400, 412 (tax. status, geogr. range).

## TRIBE BOMBINI

The Bombini includes common, large or medium-sized, social bees which are conspicuously marked with yellow and black, and sometimes, in addition, with red, or white hair. While most of the species are pollen-collecting bees, the species of the genus *Psithyrus* live as social parasites in the nests of the genus *Bombus*. Species of this tribe are found in North and South America, Eurasia including Japan and Taiwan, the Philippine Islands, Indonesia east to Java and a few species are successfully adventive in New Zealand.

Revision: Franklin, 1912. Amer. Ent. Soc., Trans. 38: 177-486 (New World spp., first part).

— Franklin, 1913. Amer. Ent. Soc., Trans. 39: 73-200, 22 pls. (New World spp., concluding part).

— Milliron, 1970. Ent. Soc. Canada, Mem. 65: i-liv (bibliography of New World spp.).

— Milliron, 1971. Ent. Soc. Canada, Mem. 82: 1-80, pls. I-XI, 14 figs., 6 maps (Part I:

contains information on development of color, distribution, external morphology, hybridization, life histories, phylogeny and classification; treats west. hemisphere spp. of genus *Bombus* and genus *Megabombus* subg. *Bombias*).

— Milliron, 1972. Ent. Soc. Canada, Mem. 89: 81-237, pls. XII-XV, maps 7-35 (Part II: treats west. hemisphere spp. of genus *Megabombus* subg. *Megabombus*).

— Milliron, 1973. Ent. Soc. Canada, Mem. 91: 239-333, pls. XVI-XX, maps 36-56 (Part III: treats west. hemisphere spp. of genus

*Pyrobombus* subg. *Cullumanobombus*).

Taxonomy: Frison, 1919. Ill. Acad. Sci., Trans. 12: 157-165 (Illinois spp.). — Jackson, 1920.

Ent. Soc. Wash., Proc. 22: 162-168 (District of Columbia and vicinity). — Lutz and

Cockerell, 1920. Amer. Mus. Nat. Hist., Bul. 42: 502-544 (catalog of N. Amer. spp.).

— Fattig, 1923. Fla. Ent. 7: 25 (Florida spp.). — Neave, 1926. Ent. News 37: 252-254

(Alberta spp.). — Frison, 1927. Amer. Ent. Soc., Trans. 53: 51-78, 2 pls. (systematic relationships of spp. in Amer. north of Mexico). — Scullen, 1927. Pan-Pacific Ent. 4: 69-76,

121-128 (Oregon spp.). — Neave, 1933. Canad. Jour. Res. 8: 62-72 (Manitoba spp.).

— Milliron, 1939. Mich. Acad. Sci. Arts and Letters, Papers 24 (2): 168-182 (Michigan spp.).

— Chandler, 1950. Indiana Acad. Sci., Proc. 60: 167-177 (Indiana spp.). — Franklin, 1954.

Amer. Ent. Soc., Trans. 80: 43-51 (evolution, distribution). — Stephen, 1957. Oreg. Agr.

Expt. Sta. Tech. Bul. 40: 1-163, 31 figs., 18 maps (revision of western N. Amer. spp.).

— Milliron, 1961. Amer. Ent. Soc., Jour. 34: 49-61. (generic reclassification). — LaBerge and

Webb, 1962. Nebr. Agr. Expt. Sta. Res. Bul. 205: 1-38 (Nebraska spp.). — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 513-544, figs. 128-134, table 18 (east. U. S. spp.).

— Medler and Carney, 1963. Wis. Agr. Expt. Sta. Res. Bul. 240: 1-47 (Wisconsin spp.).

— Pisani, Sakagami, Crestana, Aily and Lorenzetti, 1968. Acad. Sci. Brasil. Cienc. Letras,

An. 40: 373-389 (morphometrics). — Faester and Hammer, 1970. Ent. Meddel. 38: 257-302

(cent. and north. European spp.). — Stephen and Koontz, 1973. Melanderia 13: 1-12, 52 figs.

(larvae). — Plowright and Stephen, 1973. Canad. Ent. 105: 733-743 (numerical taxonomic

analysis of evolutionary relationships). — Stephen and Cheldelin, 1973. Biochem.

Systematics 1: 69-76 (phenetic groups based on  $\alpha$ -glycerophosphate dehydrogenase).

Biology: Putnam, 1864. Essex Inst. Salem, Proc. 4: 98-105 (habits). — Packard, 1864. Essex

Inst. Salem 4: 107-140, pl. 3 (life histories of New England spp., parasites). — Sladen, 1912.

The humble-bee, its life history and how to domesticate it, xiii and 283 pp., London,

Macmillan. — Frison, 1926. Ent. Soc. Amer., Ann. 19: 203-234, pl. XVII (natural enemies of

Ill. spp.). — Plath, 1927. Ent. Soc. Amer., Ann. 20: 181-192 (hibernation). — Free and Butler,

1959. Bumblebees, xiv and 208 pp., London, Collins. — Plath, 1934. Bumblebees and their

ways, 201 pp., New York, Macmillan. — Macfarlane, 1973. Ent. Soc. Ont., Ann. 104: 27-30

(predators). — Michener, 1974. The social behavior of the bees, chapter 28: 314-328, figs.,

Cambridge, Massachusetts, The Belknap Press of Harvard University Press (natural

history). — Pouvreau, 1974. Apidologie 5: 39-81 (enemies of adults). — Alford, 1975.

Bumblebees, 352 pp., London, Davis-Poynter Ltd. (life histories of British spp.).

Morphology: Barendrecht, 1931. Acta Zool. 12: 153-204, 23 figs. (corpora pedunculata).

— Palm, 1949. Opusc. Ent. 14: 27-47, 8 figs. (pharyngeal gland).

Genus *BOMBUS* Latreille

The genus *Bombus* comprises medium to large-sized, nest-building, social species, each of which normally has a worker caste and a primary reproductive caste of males and females. The females, or queens, and the workers have pollen-collecting baskets on the hindlegs. These bees usually live in colonies in or on the ground, often in the deserted nests of rodents. Most of the species in America north of Mexico depend upon a comparatively wide variety of flowers for nectar and pollen. The classification and arrangement of the subgenera in this catalog is that of Richards (1968. Brit. Mus. Nat. Hist. Ent., Bul. 22: 209-276, 39 text-figs.).

Revision: Franklin, 1912. Amer. Ent. Soc., Trans. 38: 177-486 (New World spp., first part).

—Franklin, 1913. Amer. Ent. Soc., Trans. 39: 73-200, 22 pls. (New World spp., concluding part). —Milliron, 1970. Ent. Soc. Canada, Mem. 65: i-iii (bibliography of New World spp.).

—Milliron, 1971. Ent. Soc. Canada, Mem. 82: 1-80, pls. I-XI, 14 figs., 6 maps (Part I: contains information on development of color, distribution, external morphology, hybridization, life histories, phylogeny and classification; treats west. hemisphere spp. of genus *Bombus* and genus *Megabombus* subg. *Bombias*). —Milliron, 1972. Ent. Soc. Canada, Mem. 89: 81-237, pls. XII-XV, maps 7-35 (Part II: treats west. hemisphere spp. of genus *Megabombus* subg. *Megabombus*). —Milliron, 1973. Ent. Soc. Canada, Mem. 91: 239-333, pls. XVI-XX, maps 36-56 (Part III: treats west. hemisphere spp. of genus *Pyrobombus* subg. *Cullumanobombus*). —Loken, 1973. Norsk Ent. Tidsskr. 20: 1-218, 99 figs., 26 Tables (Scandinavian spp., including certain circumpolar spp.).

Taxonomy: Lutz, 1916. Amer. Mus. Nat. Hist., Bul. 35: 501-521 (geogr. distribution). —Frison, 1919. Ill. Acad. Sci., Trans. 12: 157-165 (Illinois spp.). —Jackson, 1920. Ent. Soc. Wash., Proc. 22: 162-168 (District of Columbia and vicinity). —Lutz and Cockerell, 1920. Amer. Mus. Nat. Hist., Bul. 42: 502-539 (catalog of N. Amer. spp.). —Fattig, 1923. Fla. Ent. 7: 25 (Florida spp.). —Neave, 1926. Ent. News 37: 252-254 (Alberta spp.). —Frison, 1927. Amer. Ent. Soc., Trans. 53: 51-78, 2 pls. (systematic relationships of spp. in Amer. north of Mexico). —Scullen, 1927. Pan-Pacific Ent. 4: 69-76, 121-128 (Oregon spp.). —Plath, 1927. Biol. Bul. 52: 394-410, 6 figs., 2 tables (natural groupings based on biological characters). —Richards, 1931. Tromso Mus. Arshefter 50 (1927): 1-32, 2 pls. (spp. allied to *Bombus alpinus*). —Ritcher, 1933. Ent. Soc. Amer., Ann. 26: 53-63, 33 figs. (larvae). —Neave, 1933. Canad. Jour. Res. 8: 62-72 (Manitoba spp.). —Skorikov, 1937. Ent. Meddel. 20: 37-64 (Greenland spp. and their circumpolar relationships). —Milliron, 1939. Mich. Acad. Sci. Arts and Letters, Papers 24 (2): 168-182 (Michigan spp.). —Chandler, 1950. Indiana Acad. Sci., Proc. 60: 167-177 (Indiana spp.). —Kruselman, 1952. IXth Internatl. Congr. Ent., Trans. 1: 101-102 (subgeneric classification). —Franklin, 1954. Amer. Ent. Soc., Trans. 80: 43-51 (evolution and distribution). —Chandler, 1954. Indiana Acad. Sci., Proc. 63: 165-167 (color variation). —Franklin, 1955. Ent. News 66: 65-68 (morphometric studies of males). —Chandler, 1956. Indiana Acad. Sci., Proc. 65: 116-117 (parallel color variation). —Stephen, 1957. Oreg. Agr. Expt. Sta. Tech. Bul. 40: 1-163, 31 figs., 18 maps (west. N. Amer. spp.). —Milliron, 1960. Brooklyn Ent. Soc., Bul. 55: 87-99 (types of west. hemisphere spp.). —Milliron, 1961. Kans. Ent. Soc., Jour. 34: 49-61 (classification). —Thorp, 1962. Pan-Pacific Ent. 38: 21-28 (distribution of some west. N. Amer. spp.). —LaBerge and Webb, 1962. Nebr. Agr. Expt. Sta. Res. Bul. 205: 1-38 (Nebraska spp.). —Medler, 1962. Ent. Soc. Amer., Ann. 55: 212-218, 1 fig., 4 tables (morphometric studies of radial cell, glossa, prementum and first segment of labial palpus). —Medler, 1962. XIth Internatl. Kongr. Ent. Wien, Verh. 2 (1960): 517-521 (morphometric analyses of mouthparts). —Milliron, 1962. Canad. Ent. 94: 728-735 (synonymies of New World spp.). —Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 513-538, figs. 128-133, table 18 (eastern U. S. spp.). —Medler and Carney, 1963. Wis. Agr. Expt. Sta. Res. Bul. 240: 1-47 (Wisconsin spp.). —Hazelton and Chandler, 1964. Kans. Ent. Soc., Jour. 37: 77-87, 6 pls. (queens). —Hobbs, 1964. Canad. Ent. 96: 115-116 (phylogeny based on brood-rearing behavior). —Richards, 1968. Brit. Mus. Nat. Hist., Bul. (Ent.) 22: 211-276, 39 figs. (subgeneric classification). —Thorp, 1969. Pan-Pacific Ent. 45: 87-96 (key to spp. of *flavifrons* group). —Thorp, 1970. Pan-Pacific Ent. 46: 177-180 (notes on Ariz. records of *Bombus balteatus*, *B. franklini*, *B. sylvicola*). —Loken, 1973. Norsk Ent., Tidsskr. 20: 1-218, 99 figs. (Scandinavian spp., including certain circumpolar spp.). —Stephen and Koontz, 1973. Melanderia 13: 1-12, 52 figs. (larvae).

- Biology: Putnam, 1864. Essex Inst. Salem, Proc. 4: 98-105 (habits). — Packard, 1864. Essex Inst. Salem, Proc. 4: 107-140, pl. 3 (life histories of New England spp., parasites). — Putnam, 1865. Essex Inst. Salem, Proc. 4: 98-105 (life histories of New England spp.). — Coville, 1890. Ent. Soc. Wash., Proc. 1: 197-203 (life histories). — Sladen, 1912. The humble bee, its life history and how to domesticate it, xiii and 283 pp., London Macmillan. — Fantham and Porter, 1914. Tropical Med. Parasit., Ann. 8: 623-638 (parasitism by *Nosema bombi*). — Wheeler, 1919. Psyche 26: 145-152 (phoresy of *Antherophagus*). — Betts, 1920. Bee World 1: 171 (*Nosema*). — Frison, 1921. Amer. Nat. 55: 188-192 (*Antherophagus* in nests). — Plath, 1922. Psyche 29: 189-202 (nesting habits). — Plath, 1923. Psyche 30: 145-154 (colony trumpeter). — Plath, 1923. Biol. Bul. 45: 325-341 (queen breeding experiments). — Plath, 1923. Psyche 39: 193-202 (egg-eating habits). — Plath, 1923. Amer. Nat. 57: 571-574 (skunk predation). — Plath, 1924. Biol. Bul. 47: 65-78, 2 figs. (life histories). — Plath, 1925. Amer. Nat. 59: 441-451 (role of pollination in certain cultivated crops). — Frison, 1926. Ent. Soc. Amer., Ann. 19: 203-234, pl. XVII (natural enemies of Ill. spp.). — Frison, 1926. Econ. Ent., Jour. 19: 149-155 (artificial domiciles). — Plath, 1927. Ent. Soc. Amer., Ann. 20: 181-192 (hibernation). — Plath, 1927. Psyche 34: 122-128, 2 figs. (nesting habits of some New England spp.). — Frison, 1927. Econ. Ent., Jour. 20: 522-526 (fertilization and hibernation of queens under controlled conditions). — Frison, 1930. Canad. Ent. 62: 49-54 (flight orientation). — Balduf, 1939. Canad. Ent. 71: 66-74 (predation by *Phymata*). — Plath, 1934. Bumblebees and their ways, 201 pp., New York, MacMillan. — Balduf, 1941. Ent. Soc. Amer., Ann. 34: 204-214 (predation by *Phymata*). — Linsley, 1944. Brooklyn Ent. Soc., Bul. 39: 48-49 (vernal flight of males). — Cumber, 1949. Roy. Ent. Soc. London, Proc. 100: 1-45, 10 figs. (life history, production of worker caste). — Cumber, 1949. New Zealand Sci. Rev. 7: 96-97 (overwintering nest). — Pedersen and Bohart, 1950. Agron. Jour. 42: 608 (use as pollinators of small seed plots). — Loken, 1954. Bergen Univ. Pub., Biol. Sta. 13: 1-6 (behavior during solar eclipse). — Brian, 1954. Bee World 35: 61-67, 81-91 (foraging behavior). — Cumber, 1954. New Zealand Jour. Sci. Tech. (B) 36: 95-107 (life cycle). — Fye and Medler, 1954. Econ. Ent., Jour. 47: 672-676 (field domiciles). — Fye and Medler, 1954. Wis. Acad. Sci. Arts and Letters 43: 75-82 (spring emergence). — Fye and Medler, 1954. Econ. Ent., Jour. 47: 847-852 (temperature studies of domiciles). — Free, 1955. Roy. ent. Soc. London, Proc. (A) 30: 19-25 (queen production). — Free 1955. Ins. Sociaux 2: 195-212 (division of labor within colonies). — Free, 1955. Brit. Jour. Anim. Behav. 3: 147-153 (behavior of egg-laying workers). — Free, 1955. Ins. Sociaux 2: 303-311 (collection of food). — Manning, 1956. Behaviour 9: 164-201 (foraging behavior). — Free, 1957. Roy. Ent. Soc. London, Proc. 32: 182-184 (social facilitation and ovary development). — Medler, 1957. Ins. Sociaux 4: 252-254 (pollination of alfalfa and red clover). — Free, 1958. Behaviour 12: 233-242 (defense of colony). — Medler, 1958. Xth Internat. Congr. Ent., Proc. 4: 973-981 (use in pollination of agricultural crops). — Free and Butler, 1959. Bumblebees, xiv and 208 pp., London, Collins. — Hobbs, Virostek and Nummi, 1960. Canad. Ent. 92: 868-872 (artificial domiciling). — Holm, 1960. Arsskr. Kgl. Vet.-Landbohjsk. pp. 1-19 (domestication). — Hasselrot, 1960. Opusc. Ent. Suppl. 17: 1-192 (domestication). — Pringle, 1961. Nat. Hist. 70: 20-29 (flight behavior). — Montgomery, 1961. Outdoor Indiana 4: 16-22 (bombiculture). — Hobbs, 1962. Canad. Ent. 94: 538-541 (food-gathering behavior). — Medler, 1962. Canad. Ent. 94: 825-833, 1 fig., 3 tables (egg development and absorption). — Hobbs, Nummi and Virostek, 1962. Canad. Ent. 94: 1121-1132 (management for pollination). — Cumber, 1963. New Zealand Jour. Sci. 6: 66-74 (domiciling of an unusually large nest). — Hobbs, 1964. Canad. Ent. 96: 115-116 (brood-rearing behavior). — Hobbs, 1964. Canad. Ent. 96: 1465-1470 (ecology of *Alpinobombus*). — Hobbs, 1965. Canad. Ent. 97: 120-128 (ecology of *Bombias*). — Armitage, 1965. Kans. Ent. Soc., Jour. 38: 89-100, 4 figs., 4 tables (predation by *Phylanthus bicinctus*). — Hobbs, 1965. Canad. Ent. 97: 1297-1302 (ecology of *Cullumanobombus*). — Knee and Medler, 1965. Canad. Ent. 97: 1149-1155 (seasonal size increase in workers). — Plowright and Jay, 1966. Jour. Apicult. Research 5: 155-165 (domestication). — Hobbs, 1966. Canad. Ent. 98: 33-39 (ecology of *Fervidobombus*). — Holm, 1966. Ann. Rev. Ent. 11: 155-182 (management of red clover and alfalfa pollinating spp. for seed production). — Milliron and Oliver, 1966. Canad. Ent. 98: 207-213, 6 figs. (nests, usurpation and life histories of Ellesmere Island spp.). — Hobbs, 1966. Canad. Ent. 98: 288-294 (ecology of *Subterraneobombus*). — Johansen, 1967. Wash. State Univ. Tech. Bul. 57: 1-12 (ecology of southwest. Wash. spp.). — Hobbs, 1967. Canad.

- Ent. 99: 943-951 (management of red clover pollinating spp.). —Hobbs, 1967. *Canad. Ent.* 99: 1271-1292 (ecology of *Pyrobombus*). —Hobbs, 1968. *Canad. Ent.* 100: 156-164 (ecology of *Bombus*, s. str.). —Husband, 1968. *Mich. Acad. Sci. Arts Letters, Papers*, 53: 109-112 (Acarina associated with *Mich.* spp.). —Plowright and Jay, 1968. *Ins. Sociaux* 15: 171-192 (caste differentiation: determination of female size). —Alford, 1969. *Jour. Anim. Ecol.* 38: 149-170 (hibernation). —Eaton and Stewart, 1969. *Canad. Ent.* 101: 149-150 (damage of blueberry blossoms by bumblebees). —Alford, 1970. *Ins. Sociaux* 17: 1-10 (incipient stages of colonial development). —Free, 1970. *Jour. Anim. Ecol.* 39: 395-402 (flower constancy). —Free, 1971. *Behaviour* 40: 55-61 (stimuli eliciting mating behavior). —Kevan, 1972. *Jour. Ecol.* 60: 831-847, 1 fig., 4 tables (pollination of high arctic flowers). —Richards, 1973. *Quaest. Ent.* 9: 115-157, 29 figs. (life histories of arctic spp.). —Richards, 1974. *Kans. Ent. Soc., Jour.* 47: 141-142 (nest site selection, *Alta.* spp.). —Macior, 1974. *Melandria* 15: 1-59, 10 tables (pollination ecology of spp. in front range of Colorado Rocky Mountains). —Michener, 1974. *The social behavior of the bees*, chapter 28: 314-328, figs., Cambridge, Massachusetts, The Belknap Press of Harvard University Press (natural history). —Heinrich, 1975. *In* Gilbert and Raven, *Coevolution of animals and plants*, pp. 141-158, 4 figs., 2 tables (energetics). —Macior, 1975. *Amer. Jour. Bot.* 62: 1009-1016, 19 figs., 7 tables (role in pollination of *Delphinium tricorne*). —Macior, 1975. *Amer. Jour. Bot.* 62: 1065-1072, 21 figs., 7 tables (role in pollination of *Pedicularis*). —Richards, 1976. *Kans. Univ. Sci. Bul.* 50: 731-773, 31 figs. (parasitid mites associated with bumblebees). —Richards and Richards, 1976. *Kans. Univ. Sci. Bul.* 51: 1-18, 6 figs., 6 tables (relationships of parasitid mites associated with bumblebees). —Heinrich, 1976. *Amer. Sci.* 64: 384-395, 14 figs. (foraging behavior and economics of sociality). —Heinrich, 1976. *Ecol. Monogr.* 46: 105-128 (foraging). —Oster and Heinrich, 1976. *Ecol. Monogr.* 46: 129-133 (foraging).
- Morphology:** Cockerell and M'Nary, 1902. *Canad. Ent.* 34: 71-72 (mouthparts). —Barendrecht, 1931. *Acta Zool.* 12: 153-204, 23 figs. (corpora pedunculata). —Palm, 1948. *VIIIth Internatl. Congr. Ent., Proc.*, pp. 289-292, 2 figs. (effect of parasitic action on queens). —Palm, 1948. *Opusc. Ent., Sup.* 7: 3-101 (histology of ovaries). —Palm, 1949. *Opusc. Ent.* 14: 27-47, 8 figs. (pharyngeal gland). —Medler, 1962. *Canad. Ent.* 94: 825-833 (development and absorption of eggs). —Kullenberg, Bergstrom and Stallberg-Stenhagen, 1970. *Acta Chem. Scandinav.* 24: 1481-1482 (volatile components of cephalic marking secretion of males). —Heinrich, 1972. *Jour. Comp. Physiol.* 77: 65-79 (patterns of endothermy in queens, drones and workers). —Heinrich, 1974. *Kans. Ent. Soc., Jour.* 47: 396-404, 3 figs. (pheromone induced brooding behavior). —Heinrich, 1976. *Jour. Expt. Biol.* 64: 561-585, 24 figs. (heat exchange).

### Genus BOMBUS Subgenus BOMBUS Latreille

- Bremus* Jurine, 1801. *Intell. Blatt. Litt.-Ztg. Erlangen* 1: 164. Name suppressed by Internatl. Comn. Zool. Nomencl., Op. 135, 1939.
- Type-species: *Apis terrestris* Linnaeus. Desig. by Morice and Durrant, 1915.
- Bombus* Latreille, 1802. *Hist. Nat. Fourmis*, p. 437.
- Type-species: *Apis terrestris* Linnaeus. Monotypic.
- Bremus* Panzer, 1804(?). *Faunae Ins. German.*, h. 85.
- Type-species: *Apis agrorum* Fabricius. Desig. by Sandhouse, 1943.
- Bombus* subg. *Leucobombus* Dalla Torre, 1880. *Naturhistoriker*, v. 2, p. 40.
- Type-species: *Apis terrestris* Linnaeus. Desig. by Sandhouse, 1943.
- Bombus* subg. *Terrestribombus* Vogt, 1911. *Gesell. Naturf. Freunde, Sitzber.*, p. 55.
- Type-species: *Apis terrestris* Linnaeus. Desig. by Frison, 1927.

This subgenus occurs in the Holarctic Region as well as parts of southeastern and southwestern Asia.

- Biology:** Hobbs, 1968. *Canad. Ent.* 100: 156-164 (ecology of south. *Alta.* spp.).
- affinis** Cresson. Que. and Ont. south to Ga., west to S. Dak and N. Dak. Ecology: Frequently usurps colonies of *Bombus terricola* Kirby. Parasite: *Psithyrus ashtoni* (Cress.).
- Bombus affinis* Cresson, 1863. *Ent. Soc. Phila., Proc.* 2: 103. ♂, ♀.
- Bombus affinis* var. *novae-angliae* Bequaert, 1920. *Psyche* 27: 6. ♂, ♀.

Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 518-519, table 18 (synonymy, redescription). — Milliron, 1971. Ent. Soc. Canada, Mem. 82: 67-72, pl. X, map 4 (redescription, geogr. and floral records).

Biology: Plath, 1922. Psyche 29: 190-192 (nest, parasite). — Plath, 1927. Ent. Soc. Amer., Ann. 20: 188, 191 (hibernation, parasite). — Plath, 1934. Bumblebees and their ways, p. 135 (life history).

**lucorum** (Linnaeus). Holarctic; Alaska southward to parts of south. B. C. and Alta., east through Yukon and N. W. T. In addition to the following subspecies, other subspecies occur in Arctic Eurasia.

*Apis lucorum* Linnaeus, 1761. Fauna Suecica, Ed. 2, p. 425. ♂.

*Apis cryptarum* Fabricius, 1775. System. Ent., p. 379. ♀.

*Bombus moderatus* Cresson, 1863. Ent. Soc. Phila., Proc. 2: 109. ♀.

*Bombus terrestris* var. *schmiedeknehti* Verhoeff, 1892. Berlin. Ent. Ztschr. 36: 205.

*Terrestribombus lucorum* form *magnus* Vogt, 1911. Gesell. Naturf. Freunde, Sitzber. p. 56. ♀.

*Bombus jacobsoni* Skorikov, 1912. Rev. Russ. Ent. 12: 610.

Taxonomy: Milliron, 1971. Ent. Soc. Canada, Mem. 82: 45-50, pl. X, map. 1 (synonymy, redescription, geogr. and floral records). — Loken, 1973. Norsk Ent. Tidsskr. 20: 40-46, fig. 54 (synonymy, tax. characters, color variation).

**lucorum patagiatus** Nylander. Northeast. Siberia, Kamchatka Peninsula, east to Alaska Peninsula (Aleutian Range).

*Bombus patagiatus* Nylander, 1848. Notiser Sällskapet Fauna Fenn., Forhandl. 1: 234. ♀ (or possibly worker).

*Bombus viduus* Erichson, 1851. In Middendorff, Reise in den Aussersten Norden und Osten Sibiriens 2: 65.

*Bombus albocinctus* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 397. ♀.

*Bombus florilegus* Panfilov, 1956. Zool. Zhur. 35: 1334.

Taxonomy: Milliron, 1971. Ent. Soc. Canada, Mem. 82: 51 (synonymy, tax. characters, geogr. range).

**terricola** terricola Kirby. N. S. to Fla., west to B. C., Mont. and S. Dak. Ecology: Colonies are frequently usurped by queens of *Bombus affinis* Cress. Parasite: *Psithyrus ashtoni* (Cress.), *P. insularis* (Sm.), *P. suckleyi* (Greene).

*Bombus terricola* Kirby, 1837. Fauna Bor.-Amer., v. 4, p. 273. ♀.

Taxonomy: Stephen, 1957. Oreg. Agr. Expt. Sta. Tech. Bul. 40: 81-83, fig. 17 (redescription, geogr. records). — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 519-520, fig. 133, table 18 (redescription, geogr. and floral records). — Milliron, 1971. Ent. Soc. Canada, Mem. 82: 52-58, pl. X, map 2 (redescription, geogr. and floral records).

Biology: Plath, 1922. Psyche 29: 192-193 (nest). — Plath, 1927. Psyche 34: 122-124 (nest, parasite). — Plath, 1927. Ent. Soc. Amer., Ann. 20: 188, 191 (hibernation, parasite). — Plath, 1934. Bumblebees and their ways, p. 138 (life history, parasite).

Morphology: Heinrich, 1972. Jour. Comp. Physiol. 77: 49-64 (energetics of temperature regulation and foraging).

**terricola occidentalis** Greene. Alaska south to north. Calif., Nev., Ariz., N. Mex. and S. Dak.

Parasite: *Psithyrus fernaldae* Franklin, *P. insularis* (Sm.), *P. suckleyi* (Greene).

Predator: *Philanthus bicinctus* (Mickel).

*Bombus occidentalis* Greene, 1858. Lyc. Nat. Hist. N. Y., Ann. 7: 12. ♀, ♂.

*Bombus modestus* Smith, 1861. Jour. of Ent. 1: 153. ♀.

*Bombus proximus* Cresson, 1863. Ent. Soc. Phila., Proc. 2: 98. ♀.

*Bombus howardi* Cresson, 1863. Ent. Soc. Phila., Proc. 2: 99. ♂.

*Bombus perixanthus* Cockerell and Porter, 1899. Ann. and Mag. Nat. Hist. (7) 4: 389. ♂.

*Bombus mckayi* Ashmead, 1902. Wash. Acad. Sci., Proc. 4: 125. ♀.

*Bombus proximus* var. *coloradensis* Titus, 1902. Canad. Ent. 34: 38. ♀.

*Bombus nigroscutatus* Franklin, 1908. In Fletcher and Gibson, Ent. Soc. Ontario, Ann. Rpt. 39: 111. Nomen nudum.

*Bombus occidentalis nigroscutatus* Franklin, 1912. Amer. Ent. Soc., Trans. 38: 269, 271. ♀, ♂, ♀.

*Bremus franklini* Frison, 1921. Ent. News 32: 147. ♀.

*Bremus terricola* var. *severini* Frison, 1926. Amer. Ent. Soc., Trans. 52: 139. ♀.

Taxonomy: Stephen, 1957. Oreg. Agr. Expt. Sta. Tech. Bul. 40: 71-81, figs. 14, 15 (redescriptions, geogr. records, as *occidentalis occidentalis*, *o. nigroscutatus*, *franklini*). —Thorp, 1970. Pan-Pacific Ent. 46: 177-180 (type locality and Ariz. records of *franklini*). —Milliron, 1971. Ent. Soc. Canada, Mem. 82: 58-67, map 3 (synonymy, redescription, geogr. and floral records).

Biology: Plath, 1922. Psyche 29: 192 (nest). —Armitage, 1965. Kans. Ent. Soc., Jour. 38: 97 (predator). —Eshelman and Plowright, 1972. Canad. Ent. 104: 389-398 (nest entrance recognition). —Wellington, 1974. Science 183: 550-551 (ocellar navigation at dusk).

### Genus BOMBUS Subgenus FRATERNOBOMBUS Skorikov

*Alpigenobombus* subg. *Fraternobombus* Skorikov, 1922. Sta. Region. Protect. Plantes, Petrograd Bul. 4: 156.

Type-species: *Apathus fraternus* Smith. Desig. by Frison, 1927.

This subgenus occurs only in North and Central America.

*fraternus* (Smith). N. J. to Fla., west to N. Dak., S. Dak., Nebr., Colo. and N. Mex. Predator: *Promachus hinei* Bromley.

*Apathus fraternus* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 385. ♂.

*Bombus scutellaris* Cresson, 1863. Ent. Soc. Phila., Proc. 2: 96. ♀, ♂, ♀.

Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 526-527, figs. 131, 132, table 18 (redescription). —Milliron, 1973. Ent. Soc. Canada, Mem. 91: 243-246, pl. XVI, map 36 (redescription, geogr. and floral records).

Biology: Thorp, 1973. Pan-Pacific Ent. 49: 89 (predator).

### Genus BOMBUS Subgenus BOMBIAS Robertson

*Bombias* Robertson, 1903. Amer. Ent. Soc., Trans. 29: 176.

Type-species: *Bombias auricomus* Robertson. Orig. desig.

*Nevadensibombus* Skorikov, 1922. Sta. Region. Protect. Plantes, Petrograd Bul. 4: 149.

Type-species: *Bombus nevadensis* Cresson. Desig. by Frison, 1927.

This subgenus is present only in North America.

Biology: Hobbs, 1965. Canad. Ent. 97: 120-128 (ecology).

*nevadensis auricomus* (Robertson). Ont. to Fla., west to Tex., Okla., Colo., Wyo., Mont. and south. Canada (Sask., Alta. and B. C.). Parasite: *Brachicoma sarcophagina* (Twins.), *Physocephala sagittaria* (Say), *Psithyrus citrinus* (Sm.).

*Bombias auricomus* Robertson, 1903. Amer. Ent. Soc., Trans. 29: 176. ♀, ♂, ♀.

Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 520-521, table 18 (tax. status, redescription). —Milliron, 1971. Ent. Soc. Canada, Mem. 82: 77-80, map 6 (redescription, geogr. and floral records).

Biology: Frison, 1917. Ent. Soc. Amer., Ann. 10: 277-286, pls. 23, 24 (life history, parasites).

—Frison, 1918. Ent. Soc. Amer., Ann. 11: 43-48, pl. 3 (life history, parasite). —Howard, 1918. Ent. News 29: 114-115 (nest). —Plath, 1927. Psyche 34: 127 (nesting habits). —Plath, 1934. Bumblebees and their ways, p. 153 (life history).

*nevadensis nevadensis* Cresson. Alaska south to Calif., Ariz., N. Mex. and east to Wis.; Mexico (Hidalgo). Parasite: *Physocephala marginata* (Say), *P. texana* (Will.), *Psithyrus insularis* (Sm.), *P. suckleyi* (Greene).

*Bombus nevadensis* Cresson, 1874. Amer. Ent. Soc., Trans. 5: 102. ♀, ♂.

*Bombus improbus* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. p. 186. ♂.

*Bombus nevadensis* race *cressoni* Cockerell, 1899. Ann. and Mag. Nat. Hist. (7) 4: 388. ♀.

*Bombus nevadensis miguelsenis* Cockerell, 1937. Pan-Pacific Ent. 13: 148. ♂.

*Bombus crotchii semisuffusus* Cockerell, 1937. Pan-Pacific Ent. 13: 148. ♀.

Taxonomy: Stephen, 1957. Oreg. Agr. Expt. Sta. Tech. Bul. 40: 44-49, 61, fig. 10, map 5 (redescriptions, as *nevadensis nevadensis*, *n. migueltensis*, *crotchii semisuffusus*). — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 521-523, figs. 129, 130, table 18 (redescription). — Milliron, 1971. Ent. Soc. Canada, Mem. 82: 73-77, pl. XI, map 5 (synonymy, redescription, geogr. and floral records).

#### Genus BOMBUS Subgenus SEPARATOBOMBUS Frison

*Bremus* subg. *Separatobombus* Frison, 1927. Amer. Ent. Soc., Trans. 53: 64.

Type-species: *Apis griseocollis* Degeer. Orig. desig. (= *Bombus separatus* Cresson).

This subgenus is endemic in North America.

*griseocollis* (Degeer). Que. south to Fla., west to B. C., Wash., Oreg. and north. Calif.

*Apis griseocollis* Degeer, 1773. Mem. Serv. Hist. Insectes, v. 3, p. 576.

(?) *virginica* Olivier, 1789. Encycl. Meth., v. 4, p. 66.

(?) *virginica* Fabricius, 1793. Ent. System., v. 2, p. 318.

(?) *virginicus* Fabricius, 1804. Systema Piezatorum, p. 346.

*Bombus separatus* Cresson, 1863. Ent. Soc. Phila., Proc. 2: 165. ♀, ♂, ♀.

*Bombus mormonorum* Franklin, 1911. Amer. Ent. Soc., Trans. 37: 161. ♀, ♂, ♀.

*Bremus separatus* var. *nero* Bequaert and Plath, 1925. Mus. Compar. Zool., Bul. 67: 275. ♀.

Taxonomy: Stephen, 1957. Oreg. Agr. Expt. Sta. Tech. Bul. 40: 50-54, fig. 13, map 6 (synonymy, redescription, geogr. records). — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 527-529, figs. 129, 132, table 18 (synonymy, redescription, geogr. range and floral records). — Milliron, 1973. Ent. Soc. Canada, Mem. 91: 247-252, pl. XVI, fig. 37 (synonymy, redescription, geogr. and floral records).

Biology: Plath, 1927. Psyche 34: 125-127 (life history, as *separatus*). — Plath, 1927. Ent. Soc. Amer., Ann. 20: 190 (hibernation, as *separatus*). — Plath, 1934. Bumblebees and their ways, p. 155 (life history, as *separatus*). — Eshelman and Plowright, 1972. Canad. Ent. 104: 389-398 (nest entrance recognition).

Morphology: Stephen and Koontz, 1973. Melanderia 13: 13-29, 50 figs. (developmental changes in preadult stages).

*morrisoni* Cresson. B. C. to Calif., east to S. Dak., Nebr., Colo. and N. Mex. Parasite:

*Monodontomerus montivagus* Ashm.

*Bombus morrisoni* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. p. 183. ♀, ♂, ♀.

*Bombus morrisoni* var. *umbrosus* Friese, 1931. Konowia 10: 301.

Taxonomy: Stephen, 1957. Oreg. Agr. Expt. Sta. Tech. Bul. 40: 54-57, fig. 12, map 6 (redescription, geogr. records). — Milliron, 1973. Ent. Soc. Canada, Mem. 91: 252-256, pl. XVI, map 38 (synonymy, redescription, geogr. and floral records).

Biology: Bohart and Knowlton, 1952. Econ. Ent., Jour. 45: 890-891 (yearly population fluctuations).

#### Genus BOMBUS Subgenus CROTCHIBOMBUS Franklin

*Bombus* subg. *Crotchibombus* Franklin, 1954. Amer. Ent. Soc., Trans. 80: 51.

Type-species: *Bombus crotchii* Cresson. Orig. desig.

Endemic in western North America.

*crotchii* Cresson. Calif.; Mexico (Baja California).

*Bombus crotchii* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. p. 184. ♀.

*Bombus nigrocinctus* Provancher, 1888. Addit. Corr. Faune Ent. Canada, Hym., p. 342. ♀.

*Bremus crotchii* var. *nigricaudus* Frison, 1927. Calif. Acad. Sci., Proc. (4) 16: 375. ♀.

Taxonomy: Stephen, 1957. Oreg. Agr. Expt. Sta. Tech. Bul. 40: 57-61, fig. 15, map 7 (synonymy, redescription, geogr. records). — Milliron, 1973. Ent. Soc. Canada, Mem. 91: 256-258, pl. XVI, map 39 (synonymy, redescription, geogr. records).

#### Genus BOMBUS Subgenus CULLUMANOBOMBUS Vogt

*Bombus* subg. *Cullumanobombus* Vogt, 1911. Gesell. Naturf. Freunde, Sitzber. p. 57.



Type-species: *Apis cullumanus* Kirby. Desig. by Frison, 1927.

*Bremus* subg. *Rufocinctobombus* Frison, 1927. Amer. Ent. Soc., Trans. 53: 78, pl. xvii, fig.

9.

Type-species: *Bombus rufocinctus* Cresson. Monotypic.

Species of this subgenus are found in the Palaearctic, Nearctic and northern Neotropical Regions.

Biology: Hobbs, 1965. Canad. Ent. 97: 1293-1302 (ecology).

**rufocinctus** Cresson. N. S., N. B. and Que., west to B. C., south to Calif., Ariz., N. Mex., Kans., Minn., Ill., Mich., N. Y., Vt. and Maine; Mexico (Distrito Federal, Hidalgo, Mexico, Michoacan, Morelos and Sonora). Parasite: *Physocephala texana* (Will.), *Psithyrus fernaldae* Franklin, *P. insularis* (Sm.), *P. suckleyi* (Greene). Predator: *Philanthus bicinctus* (Mickel).

*Bombus rufocinctus* Cresson, 1863. Ent. Soc. Phila., Proc. 2: 106. ♂, ♀.

*Bombus iridis* Cockerell and Porter, 1899. Ann. and Mag. Nat. Hist. (7) 4: 390. ♀.

*Bombus prunellae* Cockerell and Porter, 1899. Ann. and Mag. Nat. Hist. (7) 4: 391. ♀.

*Bombus iridis* var. *phacelliae* Cockerell, 1906. Canad. Ent. 38: 160. ♀.

*Bombus rufocinctus* var. *astragali* Cockerell, 1907. Entomologist 40: 97. ♀.

*Bombus hyperboreus* var. *albertensis* Cockerell, 1909. Canad. Ent. 41: 36. ♀.

*Bombus* (*Bombias*) *mexicensis* Franklin, 1911. Amer. Ent. Soc., Trans. 37: 163. ♀.

*Bombus henshawi* Franklin, 1913. Amer. Ent. Soc., Trans. 38: 446. ♀.

*Bombus rufocinctus* var. *castoris* Cockerell, 1915. Ann. and Mag. Nat. Hist. (8) 15: 537. ♂.

*Bremus rufocinctus* var. *sladeni* Frison, 1926. Amer. Ent. Soc., Trans. 52: 138. ♂. Nomen nudum.

Taxonomy: Stephen, 1957. Oreg. Agr. Expt. Sta. Tech. Bul. 40: 62-70, figs. 3, 11, table 1 (synonymy, redescription, variation in color pattern, geogr. records). — Thorp, 1962. Pan-Pacific Ent. 38: 24-25 (synonymy, geogr. records from and near the type locality of *henshawi*). — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 529-530, fig. 132, table 18 (redescription). — Milliron, 1973. Ent. Soc. Canada, Mem. 91: 317-326, pl. XIX, map 34 (synonymy, redescription, geogr. and floral records).

Biology: Armitage, 1965. Kans. Ent. Soc., Jour. 38: 97 (predator).

### Genus BOMBUS Subgenus PYROBOMBUS Dalla Torre

*Bombus* subg. *Pyrobombus* Dalla Torre, 1880. Der Naturhistoriker 2: 40.

Type-species: *Apis hypnorum* Linnaeus. Monotypic.

*Bombus* subg. *Pyrrhobombus* Dalla Torre, 1882. Naturw.-med. Ver. Innsbruck, Ber. 12: 28. Emendation of *Pyrobombus* Dalla Torre.

*Bombus* subg. *Poecilobombus* Dalla Torre, 1882. Naturw.-med. Ver. Innsbruck, Ber. 12: 23. Type-species: *Bombus sitkensis* Nylander. Desig. by Sandhouse, 1943.

*Bombus* subg. *Pratobombus* Vogt, 1911. Gesell. Naturf. Freunde, Sitzber., p. 49.

Type-species: *Apis pratorum* Linnaeus. Desig. by Frison, 1927.

*Bombus* subg. *Hypnorobombus* Quilis Perez, 1927. Lab. Hist. Nat. Valencia, Trabhs. 16: 19. *Lapsus*.

*Bombus* subg. *Hypnorobombus* Quilis Perez, 1927. Lab. Hist. Nat. Valencia, Trabhs. 16: 97.

Type-species: *Apis hypnorum* Linnaeus. Monotypic. (= *Bombus hypnorum* (Linnaeus)).

*Bombus* subg. *Laponicobombus* Quilis Perez, 1927. Lab. Hist. Nat. Valencia, Trabhs. 16: 19, 22, 63.

Type-species: *Apis lapponica* Fabricius. Desig. by Milliron, 1961. (= *Bombus lapponicus* (Fabricius)).

This is a large assemblage of species which occur principally in the Holarctic Region, but a few species extend into Central America and into the East Indies.

Biology: Hobbs, 1967. Canad. Ent. 99: 1271-1292 (ecology of south. Alta. spp.).

**bifarius bifarius** Cresson. B. C., Oreg. (Steens Mts.), Calif. (Sierra Nevada Mts.), Idaho, Utah, Colo. Predator: *Philanthus bicinctus* (Mickel).

*Bombus bifarius* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. p. 185. ♀, ♂.

*Bombus vancouverensis* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. p. 187. ♂.

*Bombus cooleyi* Morrill, 1903. Canad. Ent. 35: 222.

*Bombus edwardsii* var. *kenoyeri* Cockerell, 1915. Ann. and Mag. Nat. Hist. (8) 16: 483. ♀.

*Bombus bifarius* var. *arctostaphyli* Cockerell, 1930. Ann. and Mag. Nat. Hist. (10) 5: 405. ♂.

*Bombus edwardsii* var. *fuscifrons* Swenk, 1938. Pan-Pacific Ent. 14: 30. ♀, ♀.

Taxonomy: Stephen, 1957. Oreg. Agr. Expt. Sta. Tech. Bul. 40: 139-145, figs. 5, 29, map 18 (synonymy, redescription, tax. status, variation in color pattern, geogr. records).

Biology: Armitage, 1965. Kans. Ent. Soc., Jour. 38: 97 (predator).

**bifarius nearcticus** Handlirsch. Alaska and Yukon, south to Calif. (Sierra Nevada Mts.) and Utah. Parasite: *Psithyrus insularis* (Sm.), *Volucella bombylans* (L.).

*Bombus nearcticus* Handlirsch, 1888. K. K. Naturhist. Hofmus., Ann. 3: 243. ♀, ♂, ♀.

Taxonomy: Stephen, 1957. Oreg. Agr. Expt. Sta. Tech. Bul. 40: 139-141, 145-148, figs. 5, 29, map 18 (tax. status, redescription, variation in color pattern, geogr. records).

**bimaculatus** Cresson. Ont. and Maine, south to Fla., west to Ill., Kans., Okla. and Miss.

Parasite: *Brachicoma sarcophagina* (Twins.).

*Bombus bimaculatus* Cresson, 1863. Ent. Soc. Phila., Proc. 2: 92. ♂.

*Bombus ridingsii* Cresson, 1878. Acad. Nat. Sci. Phila., Proc., p. 182. ♀, ♀.

*Bremus bimaculatus* var. *ahenus* Bequaert and Plath, 1925. Mus. Compar. Zool., Bul. 67: 275. ♀, ♂.

*Bremus bimaculatus* var. *arboreti* Bequaert and Plath, 1925. Mus. Compar. Zool., Bul. 67: 276. ♀.

Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 531-532, table 18 (redescription).

Biology: Plath, 1922. Psyche 29: 194-195 (life history). — Plath, 1927. Ent. Soc. Amer., Ann. 20: 189 (hibernation). — Frison, 1928. Ent. Amer. (n. s.) 8: 159-223 (life history). — Plath, 1934. Bumblebees and their ways, p. 141 (life history). — Townsend, 1936. Ent. Soc. Wash., Proc. 38: 92-98 (parasites).

**caliginosus** (Frison). Wash., Oreg. and Calif. Ecology: Generally inhabits more coastal areas, but the known southernmost populations occur in the San Jacinto Mts. of south Calif.; the only known nest was located in an old bird nest some 15 feet above ground.

*Bremus caliginosus* Frison, 1927. Calif. Acad. Sci., Proc. (4) 16: 376. ♂.

*Bremus caliginosus* var. *tardus* Frison, 1927. Calif. Acad. Sci., Proc. (4) 16: 380. ♂.

Taxonomy: Stephen, 1957. Oreg. Agr. Expt. Sta. Tech. Bul. 40: 100-104, fig. 20, map 13 (synonymy, redescription, geogr. records).

Biology: Pitelka, 1954. Pan-Pacific Ent. 30: 220 (nest).

**centralis** (Cresson). B. C. and Alta. south to Calif., Ariz. and N. Mex. Predator: *Philanthus bicinctus* (Mickel).

*Bombus centralis* Cresson, 1864. Ent. Soc. Phila., Proc. 3: 41. ♀.

*Bombus jurtus* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. p. 187. ♀.

*Bombus monardae* Cockerell and Porter, 1899. Ann. and Mag. Nat. Hist. (7) 4: 387. ♀.

*Bremus centralis* var. *fucatus* Frison, 1929. Amer. Ent. Soc., Trans. 55: 107. ♀.

*Bremus centralis* var. *stolidus* Frison, 1929. Amer. Ent. Soc., Trans. 55: 107. ♀.

Taxonomy: Stephen, 1957. Oreg. Agr. Expt. Sta. Tech. Bul. 40: 95-100, fig. 19, map 12 (synonymy, redescription, color variation of vestiture, geogr. records).

Biology: Armitage, 1965. Kans. Ent. Soc., Jour. 38: 97 (predator).

**cockerelli** Franklin. N. Mex., Utah.

*Bombus cockerelli* Franklin, 1913. Amer. Ent. Soc., Trans. 38: 356. ♀, ♀.

**edwardsii** Cresson. Oreg., Calif., Nev. (Douglas and Washoe Counties).

*Bombus edwardsii* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. p. 184. ♀, ♀.

*Bombus fernaldi* Franklin, 1911. Amer. Ent. Soc., Trans. 37: 157. ♀, ♂, ♀.

*Bombus lapponicus* var. *insularis* Friese, 1924. Deut. Ent. Ztschr., p. 437. ♀.

- Taxonomy:** Stephen, 1957. Oreg. Agr. Expt. Sta. Tech. Bul. 40: 109-113, fig. 22, map 10 (redescription, geogr. and floral records).
- Biology:** Linsley and Michener, 1942. Pan-Pacific Ent. 18: 29 (nest, vernal flights).
- Morphology:** Heinrich, 1974. Kans. Ent. Soc., Jour. 47: 396-404, 3 figs. (pheromone induced brooding behavior).
- flavifrons dimidiatus** Ashmead. South. B. C. to Calif.  
*Bombus dimidiatus* Ashmead, 1902. Wash. Acad. Sci., Proc. 4: 129. ♀, ♂.  
*Bombus ambiguus* Franklin, 1911. Amer. Ent. Soc., Trans. 37: 159. ♀, ♂.
- Taxonomy:** Stephen, 1957. Oreg. Agr. Expt. Sta. Tech. Bul. 40: 85-87, 92-95, map 11 (synonymy, tax. status, redescription, geogr. records).
- flavifrons flavifrons** Cresson. Alaska south to Calif., Idaho and Utah. Parasite: *Psithyrus insularis* (Smith). Predator: *Philanthus bicinctus* (Mickel).  
*Bombus flavifrons* Cresson, 1863. Ent. Soc. Phila., Proc. 2: 105. ♀, ♂, ♀.  
*Bombus alaskensis* Ashmead, 1902. Wash. Acad. Sci., Proc. 4: 128. ♀, ♀.  
*Bombus flavifrons* var. *veganus* Cockerell, 1903. Amer. Nat. 37: 891. ♂.
- Taxonomy:** Stephen, 1957. Oreg. Agr. Expt. Sta. Tech. Bul. 40: 85-92, fig. 18, map. 11 (redescription, geogr. records).
- Biology:** Sladen, 1915. Canad. Ent. 47: 84 (parasite). — Armitage, 1965. Kans. Ent. Soc., Jour. 38: 97 (predator).
- Morphology:** Milliron, 1962. Brooklyn Ent. Soc., Bul. 57: 45-46 (gynandromorph).
- frigidus** Smith. Alaska and N. W. T., south at high elevations to Colo.  
*Bombus frigidus* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 399. ♀, ♂.  
*Bombus carriei* Greene, 1860. Lyc. Nat. Hist. N. Y., Ann. 7: 170. ♀.  
*Bombus couperi* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. p. 185. ♀.
- Taxonomy:** Stephen, 1957. Oreg. Agr. Expt. Sta. Tech. Bul. 40: 124-126, fig. 25 (synonymy, redescription, geogr. range).
- frigidus** var. **alboanalis** Franklin. Man., Alaska.  
*Bombus alboanalis* Franklin, 1913. Amer. Ent. Soc., Trans. 38: 385. ♀, ♀.
- huntii** Greene. B. C. and Alta., south to Calif., Nev., Utah and N. Mex.  
*Bombus huntii* Greene, 1860. Lyc. Nat. Hist. N. Y., Ann. 7: 172. ♀.  
*Bombus rufosuffusus* Cockerell, 1905. Ent. News 16: 271. ♀.
- Taxonomy:** Stephen, 1957. Oreg. Agr. Expt. Sta. Tech. Bul. 40: 135-139, fig. 28, map 17 (synonymy, redescription, geogr. records).
- Biology:** Medler, 1959. Ent. News 70: 179-182 (nest).
- impatiens** Cresson. Ont. and Maine, south to Fla., west to Mich., Ill., Kans. and Miss. Parasite: *Psithyrus citrinus* (Smith). Predator: *Mallophora orcina* (Wied.).  
*Bombus impatiens* Cresson, 1863. Ent. Soc. Phila., Proc. 2: 90. ♂.  
*Bombus impatiens* var. *deayi* Chandler, 1956 (1955). Ind. Acad. Sci., Proc. 65: 116. ♀.
- Taxonomy:** Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 532-533, fig. 133, table 18 (synonymy, redescription, floral records).
- Biology:** Plath, 1922. Psyche 29: 195-197 (life history). — Plath, 1927. Ent. Soc. Amer., Ann. 20: 187-188, 189 (hibernation). — Frison, 1929. Brooklyn Ent. Soc., Bul. 24: 261-285 (bionomics). — Fattig, 1933. Canad. Ent. 65: 119-120 (asilid predation). — Plath, 1934. Bumblebees and their ways, p. 144 (life history). — Townsend, 1951. Ent. News 62: 115-116 (hibernation).
- melanopygus** Nylander. Alaska, south to north. Calif., Idaho and Colo. Predator: *Philanthus bicinctus* (Mickel).  
*Bombus melanopyge* Nylander, 1848. Notiser Sällskapet Fauna Fenn., Forhandl. 1: 236. ♂  
*Bombus menestriesii* Radoszkowski, 1859. Soc. Nat. Moscou, Bul. 32: 483. ♀, ♂.  
*Bombus lacustris* Cresson, 1863. Ent. Soc. Phila., Proc. 2: 103. ♀, ♂, ♀.  
*Bremus melanopygus* var. *washingtonensis* Frison, 1926. Amer. Ent. Soc., Trans. 52: 138. ♀, ♀.

Taxonomy: Stephen, 1957. Oreg. Agr. Expt. Sta. Tech. Bul. 40: 132-135, fig. 27, map 16 (synonymy, redescription, geogr. records).

Biology: Armitage, 1965. Kans. Ent. Soc., Jour. 38: 97 (predator).

*mixtus* Cresson. Alaska, south to Calif., Idaho and Colo. Predator: *Philanthus bicinctus* (Mickel).

*Bombus mixtus* Cresson, 1878. Acad. Nat. Sci. Phila., Proc., p. 186. ♀, ♀.

*Bremus edwardsii* var. *russulus* Frison, 1927. Calif. Acad. Sci., Proc. (4) 16: 374. ♀.

Taxonomy: Stephen, 1957. Oreg. Expt. Sta. Tech. Bul. 40: 113-120, fig. 23, map 15 (synonymy, redescription, geogr. records).

*perplexus* Cresson. Alaska to Maine, south to Wis., Ill. and Fla., ?Alta. Parasite: ?*Psithyrus fernaldae* Franklin.

*Bombus perplexus* Cresson, 1863. Ent. Soc. Phila., Proc. 2: 91. ♂.

*Bombus hudsonicus* Cresson, 1863. Ent. Soc. Phila., Proc. 2: 92. ♂.

*Apathus dorsalis* Provancher, 1888. Addit. Corr. Faune Ent. Canada, Hym., p. 343. ♀.

Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 533-534, table 18 (synonymy, redescription, geogr. range, floral records).

Biology: Plath, 1927. Psyche 34: 124-125 (nest). — Plath, 1927. Ent. Soc. Amer., Ann. 20: 189 (hibernation). — Plath, 1934. Bumblebees and Their ways, p. 146 (life history).

*pleuralis* Nylander. Rocky Mountain States, B. C., N. W. T., Yukon, Alaska.

*Bombus pleuralis* Nylander, 1848. Notiser Sällskapet Fauna Fenn., Forhandl. 1: 231. ♀, ♂.

*pleuralis* var. *clarus* (Frison). B. C., N. W. T., Alaska.

*Bremus pleuralis* var. *clarus* Frison, 1926. Amer. Ent. Soc., Trans. 52: 139. ♀, ♂, ♀.

*sandersoni* Franklin. Ont. to Newfoundland, south to Tenn. and N. C.

*Bombus vagans sandersoni* Franklin, 1913. Amer. Ent. Soc., Trans. 38: 353. ♀.

Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 534-535 (tax. status, redescription).

*sitkensis* Nylander. Alaska, south to Calif., Idaho, Mont. and Wyo.

*Bombus sitkensis* Nylander, 1848. Notiser Sällskapet Fauna Fenn., Forhandl. 1: 235. ♀, ♂.

*Bombus oregonensis* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. p. 185. ♂.

*Bombus mixtuosus* Ashmead, 1902. Wash. Acad. Sci., Proc. 4: 128. ♀, ♀.

Taxonomy: Stephen, 1957. Oreg. Agr. Expt. Sta. Tech. Bul. 40: 120-124, fig. 24, map 14 (redescription, geogr. records).

*sylvicola* Kirby. Alaska east to Newfoundland, south on the principal cordillera of west. U. S. (Cascade, Sierra Nevada, Great Basin and Rocky Mts.) to Calif., Nev., Utah and N. Mex.

*Bombus sylvicola* Kirby, 1837. Fauna Bor.-Amer., v. 4, p. 272.

*Bombus gelidus* Cresson, 1878. Acad. Nat. Sci. Phila., Proc. p. 184. ♀.

*Bremus sylvicola* var. *sculleni* Frison, 1929. Amer. Ent. Soc., Trans. 55: 108. ♀.

Taxonomy: Stephen, 1957. Oreg. Agr. Expt. Sta. Tech. Bul. 40: 126-130, fig. 26, map 16 (synonymy, redescription, variation, geogr. records). — Thorp, 1962. Pan-Pacific Ent. 38: 21-23 (tax. status, geogr. records, variation in colorational pattern). — Milliron, 1971. Ent. Soc. Canada, Mem. 82: 42 (tax. status). — Loken, 1973. Norsk Ent. Tidsskr. 20: 76 (tax. status).

*sylvicola* var. *johanseni* Sladen. N. W. T., Baffin Land.

*Bombus sylvicola* var. *johanseni* Sladen, 1919. Rpt. Canad. Arctic Exped. 1913-18, v. 3, p. 30g. ♀, ♀.

*sylvicola* var. *lutzi* (Frison). Ariz.

*Bremus sylvicola* var. *lutzi* Frison, 1923. Amer. Ent. Soc., Trans. 48: 309. ♀.

Taxonomy: Thorp, 1970. Pan-Pacific Ent. 46: 177, 180 (validity of Ariz. record).

*ternarius* Say. Yukon east to N. S., south to Ga., Mich., Kans., Mont. and B. C. Parasite: *Psithyrus insularis* (Smith).

*Bombus ternarius* Say, 1837. Boston Jour. Nat. Hist. 1: 414. ♂.

*Bombus ornatus* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 398. ♀, ♂, ♀.

*Bombus ternarius* var. *expallidus* Cockerell, 1916. Mich. Univ. Mus. Zool., Occas. Papers 23: 9. ♀.

Taxonomy: Stephen, 1957. Oreg. Agr. Expt. Sta. Tech. Bul. 40: 149-150, fig. 30, map 17 (redescription, variation in color of vestiture, geogr. records). — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 536-537, table 18 (synonymy, redescription).

Biology: Plath, 1927. Psyche 34: 125 (life history). — Plath, 1927. Ent. Soc. Amer., Ann. 20: 189-190 (hibernation). — Plath, 1934. Bumblebees and their ways, p. 149 (life history). — Craig, 1953. Canad. Ent. 85: 311-312 (parasite).

*vagans bolsteri* Franklin. Newfoundland.

*Bombus bolsteri* Franklin, 1913. Amer. Ent. Soc., Trans. 38: 357. ♀, ♂.

*vagans vagans* Smith. B. C. east to N. S., south to Ga., Tenn., S. Dak., Mont., Idaho and Wash.

Parasite: *Brachicoma sarcophagina* (Twins.), *Psithyrus citrinus* (Smith), *Spherularia bombi* Dufour.

*Bombus vagans* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 399. ♀.

*Bombus consimilis* Cresson, 1864. Ent. Soc. Phila., Proc. 3: 41. ♀.

*Bremus vagans* var. *coctus* Bequaert and Plath, 1925. Mus. Compar. Zool., Bul. 67: 276. ♀, ♂.

*Bremus vagans* var. *helenae* Frison, 1929. Amer. Ent. Soc., Trans. 55: 110. ♀, ♂.

Taxonomy: Stephen, 1957. Oreg. Agr. Expt. Sta. Tech. Bul. 40: 104-106, fig. 21, map 14 (redescription, geogr. records). — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 537-538 (synonymy, redescription, floral records).

Biology: Plath, 1922. Psyche 29: 197-198 (life history). — Plath, 1927. Ent. Soc. Amer., Ann. 20: 190 (hibernation). — Frison, 1930. Brooklyn Ent. Soc., Bul. 25: 109-122 (life history). — Plath, 1934. Bumblebees and their ways, p. 151 (life history).

Morphology: Heinrich, 1972. Science 175: 185-187, 2 figs. (temperature regulation).

*vandykei* (Frison). Wash. to south. Calif.

*Bremus flavifrons* var. *vandykei* Frison, 1927. Calif. Acad. Sci., Proc. (4) 16: 375. ♀.

*Pyrobombus* (*Pyrobombus*) *cascadensis* Milliron, 1970. Canad. Ent. 102: 382. ♀, ♂. N. syn.

Taxonomy: Stephen, 1957. Oreg. Agr. Expt. Sta. Tech. Bul. 40: 106-109. ♀, ♀ (tax. characters, tax. status, geogr. records). — Thorp, 1969. Pan-Pacific Ent. 45: 87-96. ♀, ♀, ♂ (tax. status, redescription, key to related spp., geogr. and floral records).

*vosnesenskii* Radoszkowski. B. C. south to Calif., Nev. (Washoe County); Mexico (Baja California).

*Bombus vosnesenskii* Radoszkowski, 1862. Soc. Nat. Moscou, Bul. 35: 589. ♀, ♂.

*Bombus columbicus* Dalla Torre, 1890. Wien. Ent. Ztg. 9: 139.

Taxonomy: Michener, 1953. Kans. Univ. Sci. Bul. 35: 1089, fig. 254 (larva). — Stephen, 1957.

Oreg. Agr. Expt. Sta. Tech. Bul. 40: 151-155, fig. 31, map 13 (redescription, geogr. records).

Biology: Hicks, 1929. Pan-Pacific Ent. 5: 97-100 (nest).

Morphology: Heinrich, 1972. Nature 239: 223-225 (physiology of brood incubation).

— Heinrich, 1974. Jour. Comp. Physiol. 88: 129-140 (brood incubation). — Heinrich, 1974.

Kans. Ent. Soc., Jour. 47: 396-404, 3 figs. (pheromone induced brooding-behavior).

— Heinrich, 1975. Jour. Comp. Physiol. 96: 155-166, 9 figs. (thermoregulation).

### Genus BOMBUS Subgenus ALPINOBOMBUS Skorikov

*Alpinobombus* Skorikov, 1914. Rev. Russe d'Ent. 14: 122.

Type-species: *Apis alpinus* Linnaeus. Desig. by Frison, 1927.

Members of this subgenus occur in the Alps, Arctic Eurasia and America, Greenland and the principal cordillera of western North America (Rocky Mountains, Cascades, Sierra Nevada Mts. and some of the Great Basin Mts.). Some of the species are circumpolar in distribution and at least one of the species (*Bombus hyperboreus* Schonherr) apparently produces no workers when it usurps the nests of other species.

Taxonomy: Loken, 1973. Norsk Ent. Tidsskr. 20: 94-118, figs. (Scandinavian spp.).

- Biology: Hobbs, 1964. *Canad. Ent.* 96: 1465-1470 (ecology of south. Alta spp.). —Milliron and Oliver, 1966. *Canad. Ent.* 98: 207-213, 6 figs. (usurpation). —Richards, 1973. *Quaest. Ent.* 9: 115-157, 29 figs., 10 tables (life history).
- balteatus** Dahlbom. Holarctic; Arctic Alaska and Canada, south on principal cordillera of west. N. Amer. to Calif. (Sierra Nevada Mts. and White Mts.) and N. Mex. (Truchas Peak), ?Ariz. (Patagonia Mts.).
- Bombus balteatus* Dahlbom, 1832. *Bombi Scand.*, p. 36. ♀.
- Bombus nivalis* Dahlbom, 1832. *Bombi Scand.*, p. 40. ♀.
- Bombus tricolor* Dahlbom, 1832. *Bombi Scand.*, p. 41. ♀.
- Bombus kirbiellus* Curtis, 1834. *Descr. insects brought home by Comdr. James Clark Ross second voyage, App. Nat. Hist.*, p. 62. ♀, ♂, ♀.
- Bombus kirbyellus* Smith, 1854. *Cat. Hym. Brit. Mus.*, v. 2, p. 397. Emend.
- Bombus putnami* Cresson, 1878. *Acad. Nat. Sci. Phila., Proc.* p. 185. ♀.
- Psithyrus kodiakensis* Ashmead, 1902. *Wash. Acad. Sci., Proc.* 4: 130. ♂.
- Bombus kirbyellus* var. *pyrrhopygus* Friese, 1902. *In* Romer and Schaudinn's *Fauna Arctica* 2: 495.
- Bombus kirbyellus* var. *tristis* Sparre-Schneider *In* Friese, 1902. *In* Romer and Schaudinn's *Fauna Arctica* 2: 495. Preocc.
- Bombus atrifasciatus* Morrill, 1903. *Canad. Ent.* 35: 224. ♀.
- Bombus kirbyellus* var. *lysholmi* Friese, 1905 (1904). *Mus. Zool. Acad. Imp. Sci. St. Petersbourg, Ann.* 9: 519.
- Bombus kirbyellus* var. *friesei* Skorikov, 1908 (1907). *Russ. Ent. Obozr.* 7: 111.
- Bombus kirbyellus* var. *cinctus* Friese, 1911. *Deut. Ent. Ztschr.* 4: 456. Preocc.
- Bombus kirbyellus* var. *cinctellus* Friese, 1911. *Deut. Ent. Ztschr.* 4: 456.
- Bombus kirbyellus* var. *similis* Friese, 1911. *Deut. Ent. Ztschr.* 4: 684. N. name.
- Alpinobombus kirbyellus appropinquans* Skorikov, 1914. *Russ. Ent. Obozr.* 14: 123.
- Alpinobombus kirbyellus* var. *subcollaris* Skorikov, 1914. *Russ. Ent. Obozr.* 14: 123.
- Alpinobombus kirbyellus* var. *gmellini* Skorikov, 1914. *Russ. Ent. Obozr.* 14: 124.
- Bombus kirbyellus* var. *semijaensis* Friese, 1923. *In* Norwegian Exped. *Novaya Zemlya* 1921, *Rpt. Sci. Results*, 14: 4.
- Bremus kirbyellus* var. *alexanderi* Frison, 1923. *Amer. Ent. Soc., Trans.* 48: 308. ♀.
- Bremus kirbyellus* var. *arizonensis* Frison, 1923. *Amer. Ent. Soc., Trans.* 48: 309. ♀.
- Taxonomy:** Thorp, 1962. *Pan-Pacific Ent.* 38: 23-24 (tax. characters, geogr. records in Calif.). —Thorp, 1970. *Pan-Pacific Ent.* 46: 177 (validity of Ariz. records). —Milliron, 1973. *Ent. Soc. Canada, Mem.* 89: 85-89, 94-107, figs. 8, 9 (synonymy, redescription, geogr. records, as *balteatus*, *kirbyellus*, and *polaris* in part). —Loken, 1973. *Norsk Ent. Tidsskr.* 20: 105-114, figs. 26, 69, 70, tables VI-IX (synonymy, tax. characters, tax. status, variation in color of vestiture).
- Biology:** Hobbs, 1964. *Canad. Ent.* 96: 1465-1470, 6 figs. (life history). —Loken, 1973. *Norsk Ent. Tidsskr.* 20: 112-114 (life history).
- hyperboreus** Schonherr. Holarctic (circumpolar); Arctic Alaska and Canada (Yukon and N. W. T), Greenland. Ecology: Usurps colonies of *Bombus polaris* Curtis, *B. jonellus* (Kirby) and possibly other species either as a casual or a facultative inquiline.
- ?*Apis arctica* Quensel in Acerbi, 1802. *Travels through Sweden, Finland and Lapland to the North Cape in the years 1798 and 1799*, v. 2, p. 253, pl. 1, fig. 7.
- Bombus hyperboreus* Schonherr, 1809. *Svenska Vetensk. Akad., Handl.* 30: 57. ♀.
- Bombus hyperboreus* var. *navvigi* Richards, 1931 (1927). *Tromsø Mus. Arshefter* 50, no. 6, p. 9. ♂.
- Bombus hyperboreus* var. *vulpinus* Friese, 1935. *Skr. Svalbard Ishavet* 65: 4.
- Alpinibombus*(!) *hyperboreus eskimo* Skorikov, 1937. *Ent. Meddel.* 20: 57. ♂.
- Alpinibombus*(!) *hyperboreus eskimo* mod. *henrikse*ni Skorikov, 1937. *Ent. Meddel.* 20: 57. ♂.
- Taxonomy:** Richards, 1931 (1927). *Tromsø Mus. Arshefter* 50, no. 6, p. 10 (tax. status). —Milliron, 1973. *Ent. Soc. Canada, Mem.* 89: 89-94, pl. XII, map 7 (synonymy, redescription, geogr. records). —Loken, 1973. *Norsk Ent. Tidsskr.* 20: 114-118, figs. 27, 71 (synonymy, nomenclature).

Biology: Milliron and Oliver, 1966. *Canad. Ent.* 98: 207-213, 6 figs. (nests, nesting habits, usurpation). — Richards, 1973. *Quaest. Ent.* 9: 115-157, 29 figs., 10 tables (nesting habits, colony development, floral relationships, nest-parasitism, adaptation to arctic environment). — Loken, 1973. *Norsk. Ent. Tidsskr.* 20: 117-118 (usurpation).

**polaris** *polaris* Curtis. Holarctic (circumpolar); Arctic Alaska, Canada, Greenland and parts of Arctic Eurasia. Ecology: Colonies are sometimes usurped by queens of *Bombus hyperboreus* Schonherr. Other subspecies, such as *Bombus polaris diabolicus* Friesse, occur in parts of Arctic Eurasia.

*Bombus arcticus* Kirby, 1821. Account of animals seen by northern expedition within Arctic Circle, p. 216. ♀, ♂. Preocc.

*Bombus polaris* Curtis, 1834. *Descr. insects brought home by Comdr. James Clark Ross second voyage*, App. Nat. Hist., p. 62. ♀, ♂.

*Bombus Groenlandicus* Smith, 1854. *Cat. Hym. Brit. Mus.*, v. 2, p. 393. ♀.

*Bombus kincaidii* Cockerell, 1898. *Ann. and Mag. Nat. Hist.* (7) 2: 324. ♀, ♂.

*Alpinibombus*(!) *arcticus* mod. *natvigioides* Skorikov, 1937. *Ent. Meddel.* 20: 56, 57. Nomen nudum.

Taxonomy: Yarrow, 1955. *Ann. and Mag. Nat. Hist.* (12) 8: 152 (tax. status, as *arcticus* var *polaris*). — Milliron, 1973. *Ent. Soc. Canada, Mem.* 89: 98-107, pl. XII, map 9 (synonymy, redescription, geogr. records, in part, includes *balteatus* in part). — Loken, 1973. *Norsk Ent. Tidsskr.* 20: 101-104, figs. 25, 68 (tax. status, nomenclature, synonymy, geogr. range, as *arcticus*).

Biology: Milliron and Oliver, 1966. *Canad. Ent.* 98: 207-213, 6 figs. (nest, nesting habits, usurpation). — Richards, 1973. *Quaest. Ent.* 9: 115-157, 29 figs., 10 tables (nesting habits, artificial domiciles, colony development, floral relationships, usurpation, adaptation to arctic environment). — Loken, 1973. *Norsk Ent. Tidsskr.* 20: 104 (nests).

**strenuus** Cresson. Alaska, Yukon, N. W. T., south to B. C., ?Alta.

*Bombus strenuus* Cresson, 1863. *Ent. Soc. Phila., Proc.* 2: 102. ♀, ♂.

*Bombus neoboreus* Sladen, 1919. *Rpt. Canad. Arctic Exped. 1913-18*, v. 3, p. 28g. ♀, ♂, ♀.

*Bombus* (*Alpinobombus*) *hyperboreus clydensis* Yarrow, 1955. *Ann. and Mag. Nat. Hist.* (12) 8: 150. ♀, ♂.

Taxonomy: Milliron, 1973. *Ent. Soc. Canada, Mem.* 89: 108-111, pl. XII, map 10 (synonymy, redescription, geogr. records).

### Genus BOMBUS Subgenus SUBTERRANEOBOMBUS Vogt

*Bombus* subg. *Subterraneobombus* Vogt, 1911. *Gesell. Naturf. Freunde, Sitzber.*, p. 62.

Type-species: *Apis subterraneus* Linnaeus. Desig. by Frison, 1927.

Species of this subgenus occur in Eurasia as far south as the Himalayas and also are found in western North America north of Mexico.

Biology: Hobbs, 1966. *Canad. Ent.* 98: 288-294 (ecology of south. Alta. spp.).

**appositus** Cresson. B. C. east to Sask., south to N. Mex., Ariz. and Calif. (Cascades and Sierra Nevada Mts.). Parasite: *Melittobia chalybii* Ashm., *Physocephala texana* (Will.), *Psithyrus fernaldae* Franklin, *P. insularis* (Sm.), *P. suckleyi* (Greene).

*Bombus appositus* Cresson, 1878. *Acad. Nat. Sci. Phila., Proc.* p. 183. ♀, ♂, ♀.

Taxonomy: Stephen, 1957. *Oreg. Agr. Expt. Sta. Tech. Bul.* 40: 22-26, fig. 6, map 1 (redescription, color variation of vestiture, geogr. records). — Milliron, 1973. *Ent. Soc. Canada, Mem.* 89: 113-117, pl. XII, map 11 (redescription, geogr. records).

**borealis** Kirby. South. Canada from N. S. to Alta. and north. U. S. from Maine to N. J., west to N. D. and S. Dak.

*Bombus borealis* Kirby, 1837. *Fauna Bor.-Amer.*, v. 4, p. 272.

Taxonomy: Mitchell, 1962. *N. C. Agr. Expt. Sta. Tech. Bul.* 152: 522-523, fig. 130, table 18 (redescription, geogr. range). — Milliron, 1973. *Ent. Soc. Canada, Mem.* 89: 117-120, pl. 12, map 12 (redescription, geogr. records).

Biology: Plath, 1922. *Psyche* 29: 193-194 (life history). — Plath, 1927. *Ent. Soc. Amer., Ann.* 20: 189 (hibernation).

Taxonomy: Plath, 1934. Bumblebees and their ways, p. 160 (life history).

**Genus BOMBUS Subgenus FERVIDOBOMBUS Skorikov**

*Fervidobombus* Skorikov, 1922. Sta. Region. Protect. Plantes, Petrograd Bul. 4: 153.

Type-species: *Apis fervida* Fabricius. Desig. by Frison, 1927.

This subgenus is found only in the New World and contains representatives in North and South America.

Biology: Hobbs, 1966. Canad. Ent. 98: 33-39 (ecology of south. Alta. spp.).

**californicus** Smith. B. C. and Alta., south to Calif., Ariz. and N. Mex.; Mexico (Baja California and Sonora). Parasite: *Psithyrus insularis* (Sm.), *P. suckleyi* (Greene).

*Bombus californicus* Smith, 1854. Cat. Hym. Brit. Mus., v. 2. p. 400. ♀.

*Bombus dubius* Cresson, 1863. Ent. Soc. Phila., Proc. 2: 97. ♀.

*Bombus consanguineus* Handlirsch, 1888. K. K. Naturhist. Hofmus., Ann. 3: 239. ♀, ♂, ♀.

*Bombus neglectulus* Ashmead, 1902. Wash. Acad. Sci., Proc. 4: 124. ♀, ♀.

Taxonomy: Stephen, 1957. Oreg. Agr. Expt. Sta. Tech. Bul. 40: 32-39, figs. 2, 8, map 3

(redescription, variation in color patterns, geogr. records, as *californicus californicus* and *c. consanguineus*). —Milliron, 1973. Ent. Soc. Canada, Mem. 89: 155-160, map 17 (tax. status, synonymy, redescription, geogr. records, as *fervidus californicus*).

**fervidus fervidus** (Fabricius). Que. and N. B. south to Ga., west to B. C., Wash., Oreg. and Calif.; Mexico (Chihuahua). Parasite: *Brachicoma sarcophagina* (Twins.), *Melittobia chalybii* Ashm., *Spheralaria bombi* Dufour. Predator: *Philanthus bicinctus* (Mickel).

Another subspecies, *Bombus fervidus sonomae* Howard, occurs in Mexico.

*Apis fervida* Fabricius, 1798. Sup. Ent. System., p. 274. ♀.

*Apis alata* Fabricius, 1798. Sup. Ent. System., p. 274.

*Bombus elatus* Fabricius, 1804. Systema Piezatorum, p. 352. Emend.

*Bombus fervidus* var. *dorsalis* Cresson, 1879. Amer. Ent. Soc., Trans. 7: 230. ♀.

*Bombus nevadensis* race *aztecus* Cockerell, 1899. Ann. and Mag. Nat. Hist. (7) 4: 389. ♀.

*Bombus fervidus* var. *umbraticollis* Friese, 1931. Konowia 10: 301.

Taxonomy: Stephen, 1957. Oreg. Agr. Expt. Sta. Tech. Bul. 40: 27-32, figs. 2, 7, map 2

(redescription, variation in color patterns, geogr. records). —Mitchell, 1962. N. C. Agr.

Expt. Sta. Tech. Bul. 152: 523-524, fig. 130, table 18 (redescription, geogr. range, floral records). —Medler, 1965. XIIth Internat. Congr. Ent., Proc. 1964: 388-389 (size variation in worker caste). —Milliron, 1973. Ent. Soc. Canada, Mem. 89: 147-155, pl. XIII, map 16

(synonymy, tax. status, redescription, geogr. and floral records).

Biology: Fairchild and Barrett, 1906. Ent. Soc. Wash., Proc. 8: 13-14, 1 pl. (copulation).

—Plath, 1922. Psyche 29: 180-187 (defense). —Plath, 1922. Psyche 29: 198-200 (life history).

—Plath, 1927. Ent. Soc. Amer., Ann. 20: 191 (hibernation). —Bequaert, 1932. Brooklyn Ent.

Soc., Bul. 27: 151 (arboreal nest). —Plath, 1934. Bumblebees and their ways, p. 166 (life

history, parasite). —Townsend, 1936. Ent. Soc. Wash., Proc. 38: 92-98 (parasite).

—Armitage, 1965. Kans. Ent. Soc., Jour. 38: 97 (predator). —Milliron, 1967. Canad. Ent. 99:

1321-1332 (artificially induced hibernation).

**pennsylvanicus pennsylvanicus** (Degeer). Que. and Ont., south to Fla., west to Minn., S. Dak.,

Nebr., Colo. and N. Mex.; Mexico and possibly Central America. Parasite: *Brachicoma*

*sarcophagina* (Twins.), *Physocephala sagittaria* (Say), *Psithyrus insularis* (Sm.), *P.*

*variabilis* (Cress.), *Spheralaria bombi* Dufour. Predator: *Mallophora bomboides* (Wied.).

*Apis pennsylvanica* Degeer, 1773. Mem. Serv. Hist. des Ins., v. 3, p. 575. ♀.

*Apis americanorum* Fabricius, 1775. Systema Ent., p. 380.

*Apis antiquensis* Fabricius, 1775. Systema Ent., p. 380. ♀.

?*Apis nidulans* Fabricius, 1798. Sup. Ent. System., p. 274. ♂.

*Bombus pallidus* Cresson, 1863. Ent. Soc. Phila., Proc. 2: 92. ♀.

*Bombus pennsylvanicus* Cresson, 1863. Ent. Soc. Phila., Proc. 2: 94. Emend.

*Psithyrus cevalliae* Cockerell, 1899. Entomologist 32: 157. ♂.

*Bombus americana* Howard, 1901. The insect book, pl. 1, figs. 30, 31. *Lapsus calami*.

*Bombus titusi* Ashmead, 1902. Ent. News 13: 50. ♂.

*Bombus pennsylvanicus* var. *umbratus* Friese, 1931. Konowia 10: 301.



**Taxonomy:** Michener, 1953. Kans. Univ. Sci. Bul. 35: 1087, figs. 248-253 (larva, as *americanorum*). — Moure, 1960. Studia Ent. 3: 151-152 (synonymy, notes on type of *antiguensis*). — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 524-526, figs. 130, 131, table 18 (synonymy, redescription, geogr. range, floral records). — Milliron, 1973. Ent. Soc. Canada, Mem. 89: 190-196, pl. XIII, map 25 (synonymy, tax. status, redescription, geogr. and floral records).

**Biology:** Frison, 1921. Canad. Ent. 53: 100 (parasite). — Rau, 1922. Acad. Sci. St. Louis, Trans. 24: 40 (life history). — Rau, 1924. Ent. Soc. Amer., Ann. 17: 368-381 (hibernation, as *americanorum*). — Plath, 1927. Ent. Soc. Amer., Ann. 20: 190 (hibernation, as *americanorum*). — Frison, 1930. Ent. Soc. Amer., Ann. 23: 644-665 (life history, as *americanorum*). — Rau, 1934. Acad. Sci. St. Louis, Trans. 28: 223 (life history, as *americanorum*). — Plath, 1934. Bumblebees and their ways, p. 163 (life history, as *americanorum*). — Rau, 1937. Brooklyn Ent. Soc., Bul. 32: 61 (nest-founding, as *americanorum*). — Brower, Brower and Westcott, 1960. Amer. Nat. 94: 343-355 (mimicry experimentation, as *americanorum*). — Milliron, 1967. Canad. Ent. 99: 1330-1331 (hibernation).

**pennsylvanicus sonorus** Say, Tex., west to Calif.; Mexico. Parasite: *Physocephala burgessi* (Will.), *P. texana* (Will.).

*Bombus sonorus* Say, 1837. Boston Jour. Nat. Hist. 1: 413. ♀.

*Bombus sonorus flavodorsalis* Franklin, 1913. Amer. Ent. Soc., Trans. 38: 409. ♀, ♂.

**Taxonomy:** Stephen, 1957. Oreg. Agr. Expt. Sta. Tech. Bul. 40: 40-43, fig. 9, map. 4 (synonymy, redescription, geogr. records, as *sonorus*). — Milliron, 1973. Ent. Soc. Canada, Mem. 89: 196-201, map 26 (tax. status, redescription, geogr. and floral records).

**Biology:** Ryckman, 1953. Pan-Pacific Ent. 29: 144 (parasite). — Hurd and Linsley, 1975. Smithsn. Contrib. Zool. 193: 48 (floral relationships).

#### UNPLACED TAXON IN BOMBUS

*Bombus praticola* Kirby, 1837. Fauna Bor.-Amer., v. 4, p. 274. This may be the correct name for *Bombus pleuralis* Nylander.

#### Genus PSITHYRUS Lepeletier

*Psithyrus* Lepeletier, 1832. Soc. Ent. France, Ann. 1: 372.

Type-species: *Apis rupestris* Fabricius. Desig. by Curtis, 1833.

*Apathus* Newman, 1835. Ent. Mag. 2: 404, footnote.

Type-species: *Apis rupestris* Fabricius. Autobasic with *Psithyrus*; name proposed to replace *Psithyrus*, thought to be preoccupied by *Psithyrus* Hubner, 1819.

*Psithyrus* subg. *Ashtonipsithyrus* Frison, 1927. Amer. Ent. Soc., Trans. 53: 69.

Type-species: *Apathus ashtoni* Cresson. Orig. desig.

*Psithyrus* subg. *Fernaldacpsithyrus* Frison, 1927. Amer. Ent. Soc., Trans. 53: 70.

Type-species: *Psithyrus fernaldae* Franklin. Orig. desig.

*Psithyrus* subg. *Eopsithyrus* Popov, 1931. Eos 7: 134.

Type-species: *Psithyrus tibetanus* (Morawitz). Orig. desig.

*Psithyrus* subg. *Metapsithyrus* Popov, 1931. Eos 7: 135.

Type-species: *Psithyrus campestris* (Panzer). Orig. desig.

*Psithyrus* subg. *Allopsithyrus* Popov, 1931. Eos 7: 136.

Type-species: *Psithyrus barbatellus* (Kirby). Orig. desig.

*Psithyrus* subg. *Ceratopsithyrus* Pittioni, 1949. Eos 25: 271.

Type-species: *Psithyrus klapperichi* Pittioni. Orig. desig. and Monotypic.

The genus *Psithyrus* contains a few species of obligate social parasites on the members of the genus *Bombus*. They closely resemble the species of *Bombus*, but lack the worker caste, and the queens lack pollen-collecting baskets on the hind legs.

**Taxonomy:** Frison, 1919. Ill. State Acad. Sci., Trans. 12: 157-165 (Ill. spp.). — Frison, 1923.

Amer. Ent. Soc., Trans. 48: 307-326 (synonymy, tax. characters, geogr. records). — Frison, 1926. Amer. Ent. Soc., Trans. 52: 129-145 (synonymy, tax. characters, geogr. records).

— Frison, 1927. Amer. Ent. Soc., Trans. 53: 51-78, pls. XVI-XVII (systematic relationships

- of spp. in America north of Mexico). —Milliron, 1961. Kans. Ent. Soc., Jour. 34: 59-60 (subgeneric synonymy). —Medler, 1962. Canad. Ent. 94: 444-447, 1 fig., 3 tables (morphometric study). —Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 538-544, fig. 134, table 18 (east. U. S. spp.).
- Biology: Sladen, 1899. Ent. Monthly Mag. 35: 230-234 (habits, host). —Sladen, 1915. Canad. Ent. 47: 84 (habits, host). —Frison, 1921. Canad. Ent. 53: 100-101 (hosts). Plath, 1922. Biol. Bul. 43: 23-44, pl. I (life history, hosts). Frison, 1926. Ent. Soc. Amer., Ann. 19: 205-221, pl. XVII, fig. 3b (life history, hosts). —Plath, 1927. Brooklyn Ent. Soc., 22: 121-125 (life history, enemy of *Apis mellifera*). —Plath, 1934. Bumblebees and their ways, 201 pp., New York, Macmillan (life history, hosts).
- ashtoni** (Cresson). P. E. I. west to Sask., south to N. Dak., Minn., Wis., Mich., Ohio, W. Va. and Va. Host: *Bombus affinis* Sm., *B. terricola* Kby.  
*Apathus ashtoni* Cresson, 1864. Ent. Soc. Phila., Proc. 3: 42. ♀.
- Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 539-540, table 18 (redescription).
- Biology: Plath, 1922. Psyche, 29: 191 (hibernation, hosts). —Plath, 1934. Bumblebees and their ways, p. 169 (habits, hosts).
- citrinus** (Smith). P. E. I. and N. B., south to Fla. and Ala., west to S. Dak. and N. Dak. Host: *Bombus impatiens* (Cr.), *B. nevadensis auricomus* (Robt.), *B. vagans* (Sm.); also occasionally attempts to invade hives of *Apis mellifera* Linn. For years *Psithyrus laboriosus* (Fabricius) was considered to be the correct name for this species; however, an examination of the type specimen (see Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 333) has demonstrated that *laboriosus* is a member of the genus *Emphoropsis* in the Anthophoridae.  
*Apathus citrinus* Smith, 1854. Cat. Hym. Brit. Mus., v. 2, p. 385. ♂.  
*Apathus contiguus* Cresson, 1863. Ent. Soc. Phila., Proc. 2: 112. ♂.
- Taxonomy: Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 540-541, table 18 (redescription).
- Biology: Frison, 1921. Canad. Ent. 53: 100-101 (habits, hosts, as *laboriosus*). —Bequaert and Plath, 1925. Mus. Compar. Zool., Bul. 67: 268-272 (life history, host, as *laboriosus*). —Plath, 1927. Ent. Soc. Amer., Ann. 20: 191 (hibernation, as *laboriosus*). —Plath, 1927. Brooklyn Ent. Soc., Bul. 29: 121-125 (inquiline in hives of *Apis mellifera* Linn.). —Plath, 1934. Bumblebees and their ways, p. 175 (hosts, habits).
- fernaldae** Franklin. Alaska and Canada, south to N. C. and Tenn. in east. U. S. and Colo. and Calif. in west. U. S. Host: *Bombus appositus* Cress., *B. perplexus* Cress., *B. rufocinctus* Cress., *B. terricola occidentalis* Greene.  
*Psithyrus fernaldae* Franklin, 1911. Amer. Ent. Soc., Trans. 37: 164. ♀.  
*Psithyrus tricolor* Franklin, 1911. Amer. Ent. Soc., Trans. 37: 167. ♂.  
*Psithyrus wheeleri* Bequaert and Plath, 1925. Mus. Compar. Zool., Bul. 67: 265. ♀, ♂.
- Taxonomy: Frison, 1923. Amer. Ent. Soc., Trans. 48: 321 (synonymy). —Frison, 1926. Amer. Ent. Soc., Trans. 52: 145 (tax. status of *wheeleri*). —Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 541-542, fig. 134, table 18 (redescription).
- Biology: Plath, 1927. Ent. Soc. Amer., Ann. 20: 191 (hibernation). —Plath, 1934. Bumblebees and their ways, p. 171 (habits, hosts).
- Morphology: Milliron, 1961. Brooklyn Ent. Soc., Bul. 55: 109-113, 2 figs. (gynandromorph).
- insularis** (Smith). Canada, south to Calif., Ariz. (Oak Creek Canyon), N. Mex., Nebr. (Sioux County), N. Y. (Ithaca) and N. H. (Durham), ?Alaska (Berg Bay). Host: *Bombus appositus* Cress., *B. bifarius nearcticus* Handlirsch, *B. californicus* Sm., *B. flavifrons* Cress., *B. nevadensis nevadensis* Cress., *B. pennsylvanicus* (DeG.), *B. rufocinctus* Cress., *B. ternarius* Say, *B. terricola occidentalis* Greene, *B. t. terricola* Kby.  
*Bombus interruptus* Greene, 1858. Lyc. Nat. Hist. N. Y., Ann. 7: 11. ♀. Preocc.  
*Apathus insularis* Smith, 1861. Jour. of Ent. 1: 155. ♀.

*Psithyrus consultus* Franklin, 1913. Amer. Ent. Soc., Trans. 38: 459. ♂.

*Psithyrus crawfordi* Franklin, 1913. Amer. Ent. Soc., Trans. 38: 464. ♀, ♂.

Taxonomy: Frison, 1923. Amer. Ent. Soc., Trans. 48: 321-322 (synonymy). — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 542-543, table 18 (redescription).

Biology: Sladen, 1915. Canad. Ent. 47: 84 (host). — Plath, 1927. Ent. Soc. Amer., Ann. 20: 191 (hibernation, host). — Plath, 1934. Bumblebees and their ways, p. 173 (life history, hosts). — Craig, 1953. Canad. Ent. 85: 311-312 (host).

**suckleyi** (Greene). Alaska, south to Calif., Utah and Colo. Host: *Bombus appositus* Cress., *B. californicus* Sm., *B. nevadensis nevadensis* Cress., *B. rufocinctus* Cress., *B. terricola occidentalis* Greene, *B. t. terricola* Kby.

*Bombus suckleyi* Greene, 1860. Lyc. Nat. Hist. N. Y., Ann. 7: 169. ♂.

*Psithyrus latitarsus* Morrill, 1903. Canad. Ent. 35: 224. ♀.

Taxonomy: Frison, 1926. Amer. Ent. Soc., Trans. 52: 144 (synonymy).

**variabilis** (Cresson). Ohio south to Fla., west to N. Dak., S. Dak., Nebr. Kan., Okla., Tex. and N. Mex.; Mexico (Orizaba). Host: *Bombus pennsylvanicus* (Deg.).

*Apathus variabilis* Cresson, 1872. Amer. Ent. Soc., Trans. 4: 284. ♀, ♂.

*Psithyrus bicolor* Franklin, 1913. Amer. Ent. Soc., Trans. 38: 460. ♀.

Taxonomy: Frison, 1923. Amer. Ent. Soc., Trans. 48: 322 (synonymy). — Mitchell, 1962. N. C. Agr. Expt. Sta. Tech. Bul. 152: 543-544, fig. 134, table 18 (redescription).

Biology: Frison, 1916. Brooklyn Ent. Soc., Bul. 11: 46-47 (habits, host). — Frison, 1921. Canad. Ent. 53: 100 (host). — Webb, 1961. North Central Branch, Ent. Soc. Amer., Proc. 16: 16 (habits).

#### SUBFAMILY APINAE

The subfamily contains two tribes, the Meliponini and the Apini of which only the latter is represented in America north of Mexico by the introduced European honeybee. The members of this subfamily are all highly eusocial and live in perennial colonies.

#### TRIBE APINI

The tribe includes only the genus *Apis* which prior to the activities of man was indigenous to Africa, Eurasia, Japan, Formosa, the Philippines and Indonesia. One of its species, the common honeybee (*Apis mellifera* Linnaeus) has been successfully introduced into the Western Hemisphere and many areas of the Old World beyond its original range (Africa, Europe, and western Asia).

Taxonomy: Maa, 1953. Treubia 21: 525-640 (classification). — Ruttner, 1968. In Chauvin, Traite de biologie de l'abeille, Paris, Masson et cie 1: 27-44 (review of included spp. and races).

Biology: Michener, 1974. The Social Behavior of the Bees, chapter 30: 347-366 (natural history).

Morphology: Cruz-Landim, 1974. N. Y. Ent. Soc., Jour. 71: 2-31 (evolution of wax and scent glands).

#### Genus APIS Linnaeus

*Apis* Linnaeus, 1758. Syst. Nat., Ed. 10, p. 343.

Type-species: *Apis mellifera* Linnaeus. Desig. by Latreille, 1810. (= *Apis mellifica* Linnaeus).

*Apicula* Rafinesque, 1814. Principes fondamentaux de somiologie, Palermo, p. 29. N. name, proposed unnecessarily to replace *Apis* Linnaeus.

*Apiarus* Rafinesque, 1815. Analyse Nature ou Tabl. Univers, Palermo, p. 123. N. name, proposed unnecessarily to replace *Apis* Linnaeus.

*Megapis* Ashmead, 1904. Ent. Soc. Wash., Proc. 6: 120.

Type-species: *Apis dorsata* Fabricius. Orig. desig.

*Micrapis* Ashmead, 1904. Ent. Soc. Wash., Proc. 6: 122.

Type-species: *Apis florea* Fabricius. Monotypic and orig. desig.

*Sigmatapis* Maa, 1953. *Treubia* 21: 556.

Type-species: *Apis cerana* Fabricius. Orig. desig.

*mellifera* Linnaeus. Worldwide. Introduced in Western Hemisphere. Represented in the Old World by numerous subspecies, several of which have been introduced into North America with the result that much interbreeding has occurred among them. The escaped bees of the woodlands are largely *A. mellifera mellifera* (German bee) while the beekeepers' bees are largely *A. mellifera ligustica* (Italian bee). *A. mellifera remipes* (Caucasian bee) is also utilized by some beekeepers. For convenience these forms are listed below in the synonymy.

*Apis mellifera* Linnaeus, 1758. *Syst. Nat.*, Ed. 10, p. 576.

*Apis mellifica* Linnaeus, 1761. *Fauna Suecica*, Ed. 2, p. 421. N. name, proposed unnecessarily to replace *mellifera*.

*Apis mellifica* var. *ligustica* Spinola, 1806. *Insectorum Liguria*, v. 1, p. 35.

*Apis mellifica* var. *remipes* Gerstaecker, 1862. *Geog. Verbr. d. Honigbiene*, p. 61.

Taxonomy: Alpatov, 1929. *Quart. Rev. Biol.* 4: 1-58 (biometric studies). — Michener, 1953. *Kans. Univ. Sci. Bul.* 35: 1094, figs. 275-280 (larva). — Torchio and Torchio, 1975. *Utah State Agr. Expt. Sta., Research Rpt.* 20: 1-36, 78 figs. (larvae).

Biology: Buttel-Reepen, 1903. *Die stammesgeschichtliche Entstehung des Bienenstaates*, 167 pp., Leipzig, G. Thieme. — Buttel-Reepen, 1915. *Leben und Wesen der Bienen*, 300 pp., Braunschweig, Vieweg und Sohn. — Philip and Vansell, 1932. *Calif. Agr. Expt. Sta., Circ.* 62: 1-27 (pollination of deciduous fruits). — Butler, 1949. *The honeybee*, 436 pp., Oxford, Clarendon Press. — Percival, 1950. *New Phytol.* 49: 40-63 (pollen collection). — Frisch, 1950. *Bees, their vision, chemical senses and language*, 119 pp., Ithaca, New York, Cornell Univ. Press. — Wykes, 1952. *Jour. Expt. Biol.* 29: 511-519 (nectar preferences). — Frisch, 1953. *Aus dem Leben der Bienen*, 180 pp., Revised ed., Berlin, Springer-Verlag. — Ribbands, 1953. *The Behavior and Social Life of Honeybees*, 352 pp., Bee Research Assn. Ltd. (republished in 1964, by Dover Publ., Inc., New York). — Butler, 1954. *The World of the Honeybee*, 226 pp., London, Collins. — Frisch, 1955. *The Dancing Bees*, 183 pp., New York, Harcourt, Brace and Co. — Smith, 1960. *Beekeeping in the tropics*, 265 pp., London, Longmans. — Lindauer, 1961. *Communication among social bees*, 143 pp., Cambridge, Massachusetts, Harvard Univ. Press. — Singh, 1962. *Beekeeping in India*, 275 pp., New Delhi, India Council of Agr. Research. — Grout, 1963. *The hive and the honeybee*, 652 pp., Revised, Hamilton, Illinois, Dadant and Sons. — Zander, 1964. *Das Leben der Bienen*, (Handbook der Bienenkunde, vol. 4), 6th edition, Stuttgart, K. Weiss. — Frisch, 1965. *Tanzsprache und Orientierung der Bienen*, 566 pp., Berlin, Springer-Verlag. (republished in 1967 in English by Belknap Press, Harvard University Press). — Ordetx and Espina, 1966. *La apicultura en las tropicos*, 412 pp., Mexico City, B. Trucco. — Frisch, 1967. *The dance language and orientation of bees*, 566 pp., Cambridge, Massachusetts, Harvard Univ. Press. — Chauvin, 1968. *Traite de biologie de l'abeille*, vols. I-V, Paris, Masson et Cie. — Wenner, 1971. *The bee language controversy*, 109 pp., Educational Programs Improvement Corporation, Boulder, Colo. — Michener, 1975. *Ann. Rev. Ent.* 20: 399-416 (Brazilian bee problem). — Edrich, 1977. *Anim. Behaviour* 25: 342-363 (interaction of light and gravity in the orientation of the waggle dance).

Morphology: Stellwaag, 1910. *Ztschr. Wiss. Zool.* 95: 518-550, 6 figs., 2 pls. (structure and mechanics of flight apparatus). — Frisch, 1915. *Zool. Jahrb. abt. Zool. Physiol.* 35: 1-182 (form and color senses). — Snodgrass, 1925. *Anatomy and Physiology of the honeybee*, 327 pp., New York, McGraw Hill Co. — Kuhn, 1927. *Ztschr. Vergleich. Physiol.* 5: 762-800 (color vision). — Trojan, 1930. *Ztschr. Morph. Okol. Tiere* 19: 678-685 (Dufour's gland). — Hertz, 1939. *Jour. Expt. Biol.* 16: 1-8 (color vision). — Snodgrass, 1942. *Smithson. Misc. Coll.* 103: 1-120, 32 figs. (skeletal-muscular mechanisms). — Snodgrass, 1956. *Anatomy of the honeybee*, 334 pp., Ithaca, New York, Cornell Univ. Press. — Simpson, 1960. *Jour. Ins. Physiol.* 4: 107-121 (function of salivary glands). — Barbier and Lederer, 1960. *Acad. Sci. Paris, Compt. Rend.* 250: 4467-4469 (chemical structure of royal jelly). — Barbier, Lederer and Nomura, 1960. *Acad. Sci. Paris, Compt. Rend.* 251: 1133-1135 (synthesis of substances in royal jelly). — Barbier and Pain, 1960. *Acad. Sci. Paris, Compt. Rend.* 250: 3740

- (mandibular gland secretions). —Daly, 1964. Calif. Univ. Pubs. Ent. 39: 1-77, 54 figs. (skeleto-muscular morphogenesis of thorax and wings). —Youseff, 1971. Smithsn. Contrib. Zool. 99: 1-54, 10 figs., 5 tables (topography of cephalic musculature and nervous system). —Cruz-Landim, 1974. Brasil. Biol., Rev. 34: 105-113, 5 figs. (cardiac musculature). —Cruz-Landim, 1975. Ciencia e Cultura 27: 278, 3 figs., 2 tables (extracellular crystals).











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